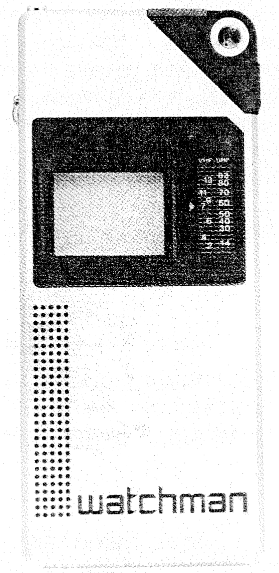
FD-210BE

SERVICE MANUAL

AEP Model
UK Model
AS Model



watchman

September, 1983

SPECIFICATIONS

Also refer to "ADJUSTMENT MANUAL".

Television system	British UHF TV standards or CCIR Western European TV standards, selectable with the BAND SELECT switch
Channel coverage	UK: UHF channels B21 - 68 Western Europe: VHF channels E2 - 12 UHF channels E21 - 68
Aerial	VHF/UHF telescopic aerial 75-ohm external aerial jack
Picture tube	Approx. 5 cm (2 inch) picture measured diagonally 50-degree deflection angle
Output	Earphone/headphone jack (minijack) load impedance 8 - 32 ohms
Power requirements	External power input jack (required power 6 V dc): AC power adaptor (supplied) UK: AC-129UB for use on 240 V ac, 50 Hz Western Europe: AC-129E for use on 220 V ac, 50 Hz Car battery cord (optional) DCC-127A or DCC-120 for use on 12 V car battery Battery case (optional) BP-25 for use on four alkaline batteries IEC designation LR14 (size C) Internal batteries: Batteries (optional) four alkaline batteries IEC designation LR6 (size AA) Rechargeable battery pack (optional) BP-82
Power consumption	7 W ac with Sony AC-129UB or AC-129E ac power adaptor
Dimensions	Approx. 88 × 204 × 37 mm (w/h/d) (3½ × 8 × 1½ inches) incl. projecting parts and controls
Weight	Approx. 580 g (1 lb 5 oz) not incl. batteries
Supplied accessories	AC power adaptor AC-129UB (1, for UK model), AC-129E (1, for Continental European model) Ear receiver (1) Carrying case (1)

MICROFILM

FLAT BLACK AND WHITE TV

SONY®

B&W

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK ⚠ ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY. CIRCUIT ADJUSTMENTS THAT ARE CRITICAL TO SAFE OPERATION ARE IDENTIFIED IN THIS MANUAL. FOLLOW THESE PROCEDURES WHENEVER CRITICAL COMPONENTS ARE REPLACED OR IMPROPER OPERATION IS SUSPECTED.

SERVICEMAN WARNING

TO AVOID POSSIBLE EXPOSURE TO X-RADIATION. TAKE X-RADIATION PROTECTIVE MEASURES (SEE SERVICE MANUAL) FOR PERSONNEL DURING SERVICING.

ANODE DISCHARGE WARNING

TO DETERMINE PRESENCE OF HIGH VOLTAGE. USE A HIGH IMPEDANCE H. V. METER. CONNECT (–) TO CRT GROUNDING CONTACT AND (+) TO THE CRT ANODE LEAD.

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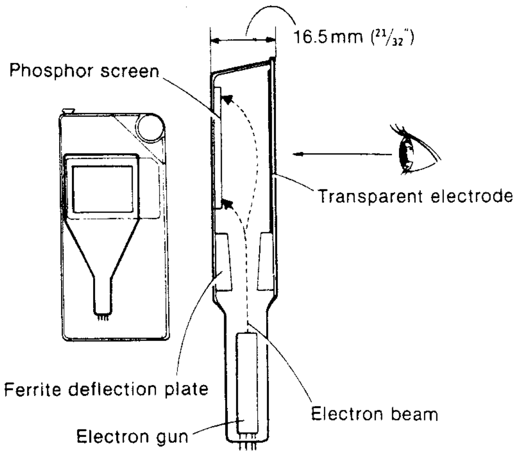
SECTION 1
GENERAL

FEATURES

The FD-210BE is a handy 5 cm (2") flat TV, which employs Sony's newly-developed monochrome 16.5 mm ($^{21}/_{32}$") thick FD (flat display) tube.



- BAND SELECT switch with UK and CCIR positions.
- SOUND position for listening only to TV sound consumes less power, so you can conserve the batteries.
- Built-in stand for tabletop viewing.
- You can connect the headphones with a stereo miniplug in addition to the supplied ear receiver.
- Four different power sources: house current, batteries, rechargeable battery, and 12 V car battery.

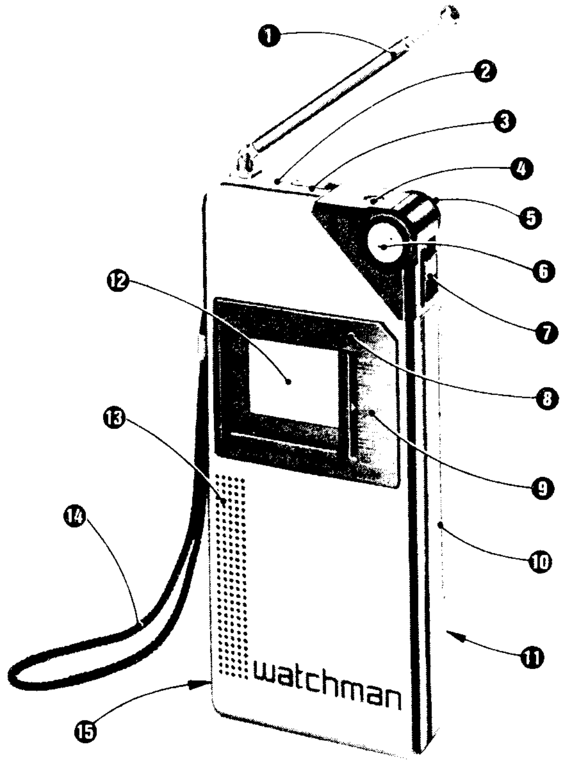
PRECAUTIONS

- Operate the set only on 6 V dc.

For ac operation, use the supplied ac power adaptor. For car battery operation, use the car battery cord recommended for this set.

- After operating the TV set with an ac power adaptor and when the set is not to be used for an extended period of time, disconnect the ac power adaptor from the wall outlet. The POWER switch on the TV set does not turn the ac adaptor off.
- To disconnect the ac power cord, pull it out by grasping the plug. Never pull it by the cord.
- Do not leave the set in a location near heat sources, or in a place used at direct sunlight, excessive dust, mechanical vibration, or shock.
- Should any liquid or solid object fall into the set, remove the batteries and disconnect the ac power adaptor, and have the set checked by qualified personnel before operating it any further.
- Avoid rough handling as this TV uses a relatively fragile tube.
- Clean the case with a soft cloth slightly moistened with water or a mild detergent solution. Do not use alcohol, benzine or thinner as they may mar the finish.

PARTS IDENTIFICATION



❶ Telescopic antenna

❷ EXT ANT (external antenna) jack

❸ BAND SELECT switch

❹ 🎧 (earphone) jack

❺ VOLUME control

❻ TUNING control

❼ POWER switch

❽ Power indicator

❾ Dial scale

❿ Battery compartment

⓫ Stand (rear)

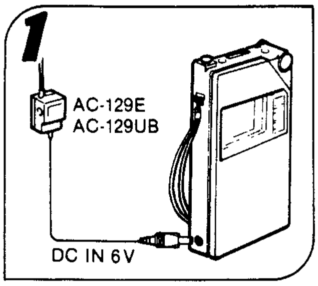
⓬ Screen

⓭ Speaker
Normally use an earphone to listen to the TV
This speaker is a supplementary device.

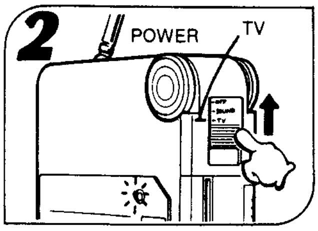
⓮ Carrying strap

⓯ DC IN 6 V (external power input) jack

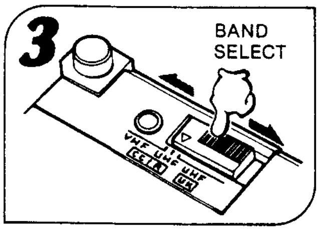
TV VIEWING ON HOUSE CURRENT



First connect the AC129E/129UB ac power adaptor (supplied) to the TV's DC IN 6V jack, and then to a wall outlet.



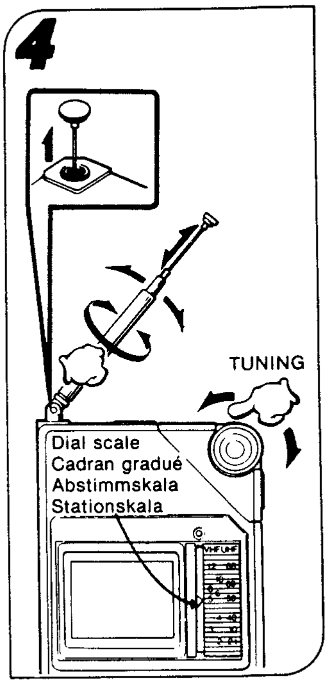
Set the POWER switch to TV. The green power indicator will light up.



Set the BAND SELECT switch to the appropriate position.

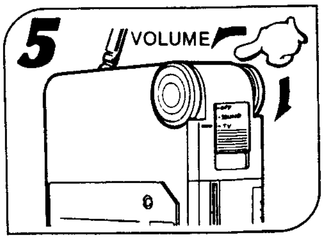
UHF UK ···	for receiving UHF channels in the U.K.
VHF CCIR ···	for receiving VHF channels in Continental Europe
UHF CCIR ···	for receiving UHF channels in continental Europe

Turn the TUNING knob to tune in the desired channel.
Pull out the antenna to its full length, then adjust its length, direction, and angle for the best reception.



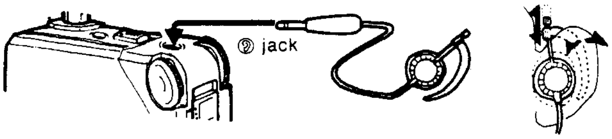
Adjust the VOLUME control.
Turn downwards for more volume.

Normally use an earphone to listen to the TV.
The built-in speaker is a supplementary device.



TO LISTEN TO THE TV SOUND WITH NO PICTURE
Set the POWER switch to SOUND.

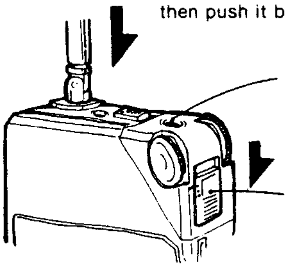
TO LISTEN WITH AN EARPHONE
Usually the use of an earphone is recommended.
Connect the supplied ear receiver to the ⑨ jack.
You can wear this earphone on either your right or left ear.



You can connect stereo headphones with a stereo miniplug to the ⑨ jack, too. The sound you will hear is monaural.

Caution: Avoid operating your set at so loud a volume that extended listening might affect your hearing.

AFTER USING

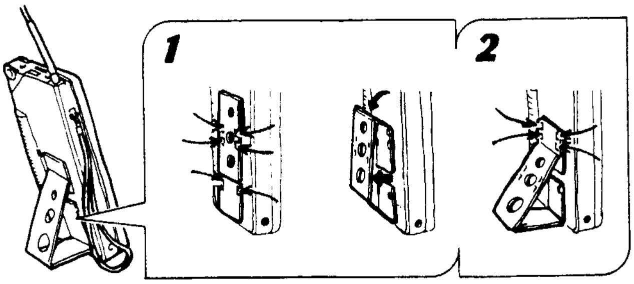


Position the antenna perpendicularly to the set, then push it back into the set.

Disconnect the earphone.

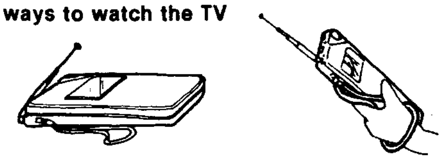
Set the POWER switch to OFF.

STAND SETTING

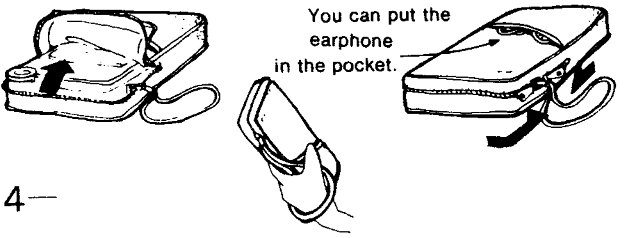


1 Pull out the stand by unfastening the six holes from the projections.
2 Fasten the four upper holes to the projections.
Make sure the stand is secure, or the set may fall down.

Other ways to watch the TV



HOW TO USE THE CARRYING CASE



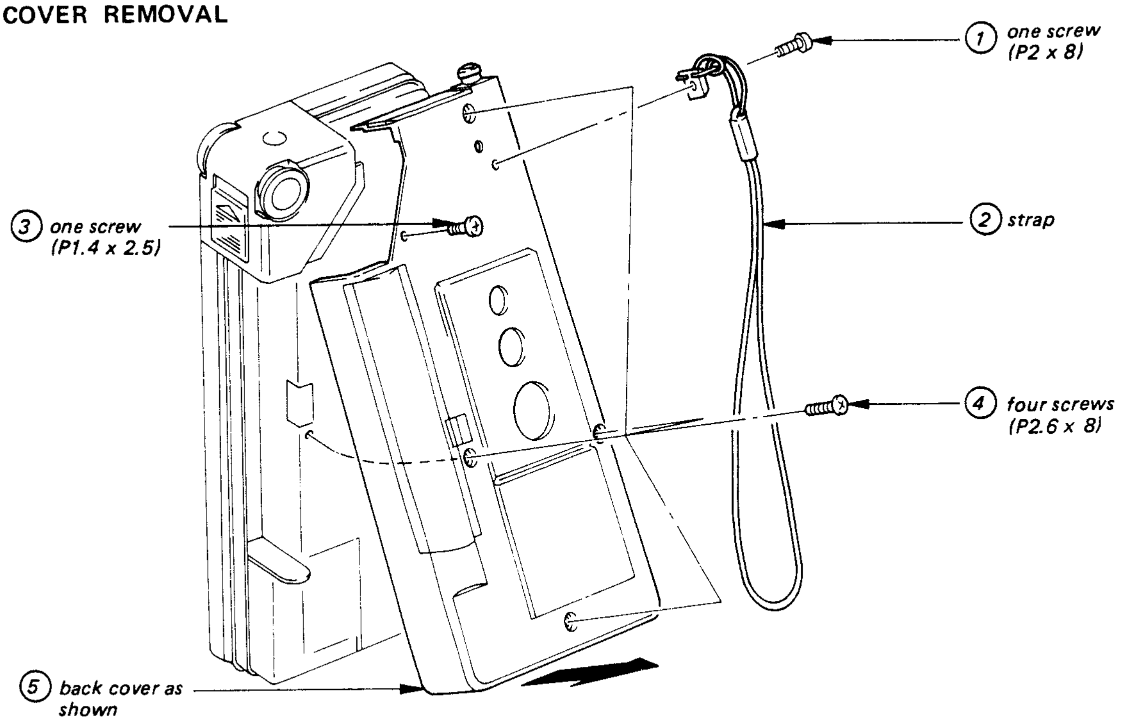
You can put the earphone in the pocket.

SECTION 2

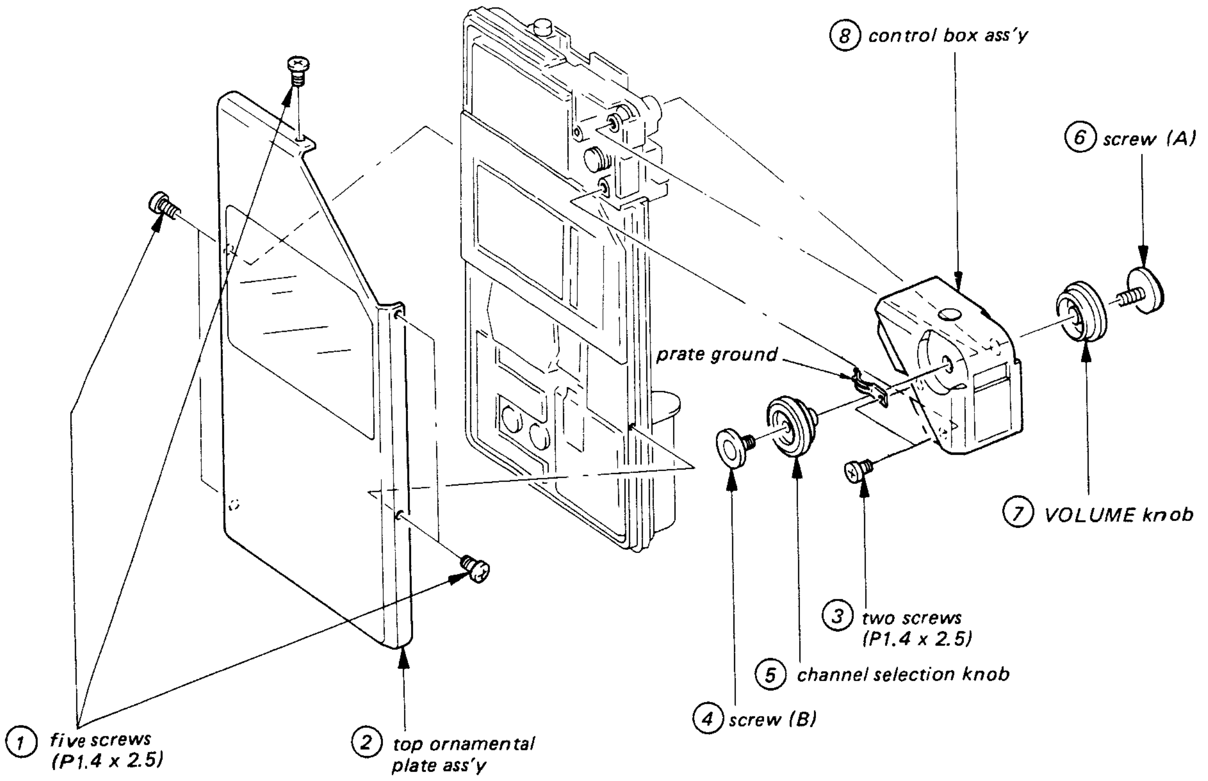
DISASSEMBLY (AND REPLACEMENT)

Note: Follow the disassembly procedure in the numerical order given.

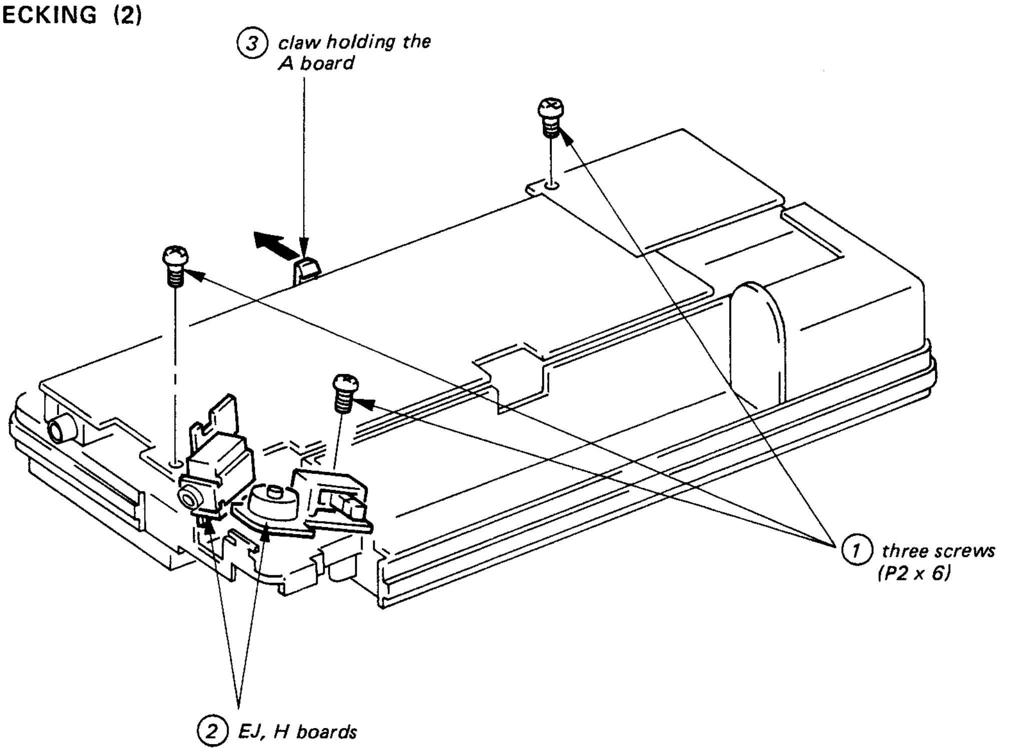
BACK COVER REMOVAL


① one screw (P2 x 8)
② strap
③ one screw (P1.4 x 2.5)
④ four screws (P2.6 x 8)
⑤ back cover as shown

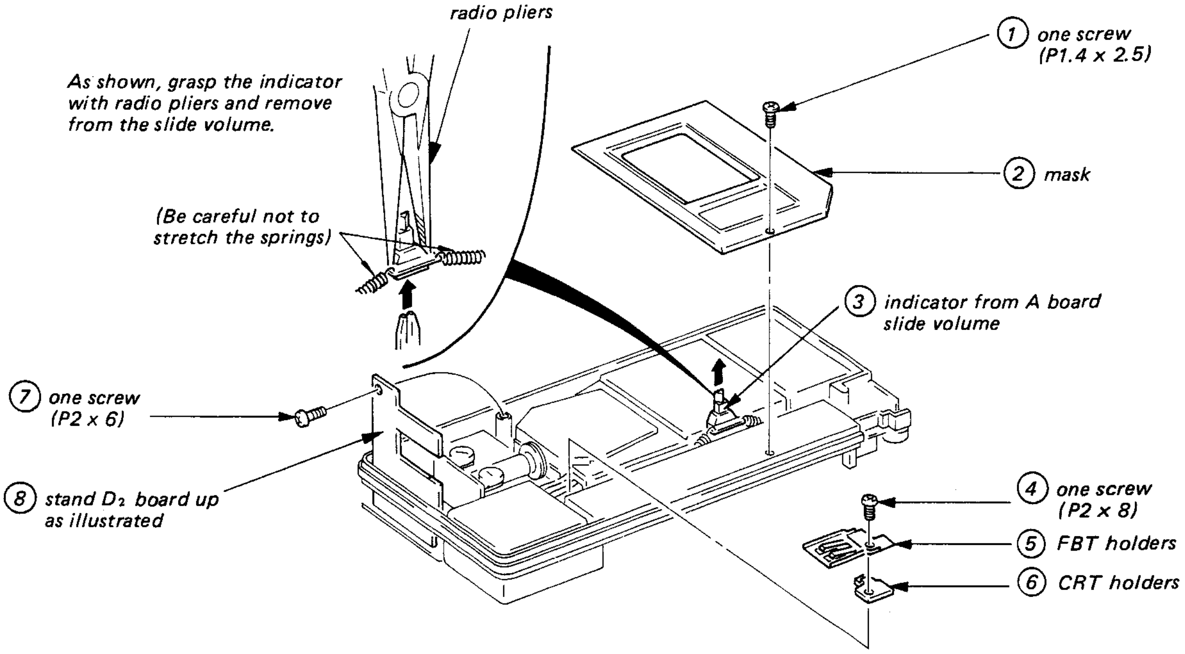
TOP ORNAMENTAL PLATE ASS'Y AND CONTROL BOX ASS'Y REMOVAL


⑧ control box ass'y
⑥ screw (A)
prate ground
⑦ VOLUME knob
③ two screws (P1.4 x 2.5)
⑤ channel selection knob
④ screw (B)
① five screws (P1.4 x 2.5)
② top ornamental plate ass'y

A BOARD CHECKING (2)


③ claw holding the A board
① three screws (P2 x 6)
② EJ, H boards

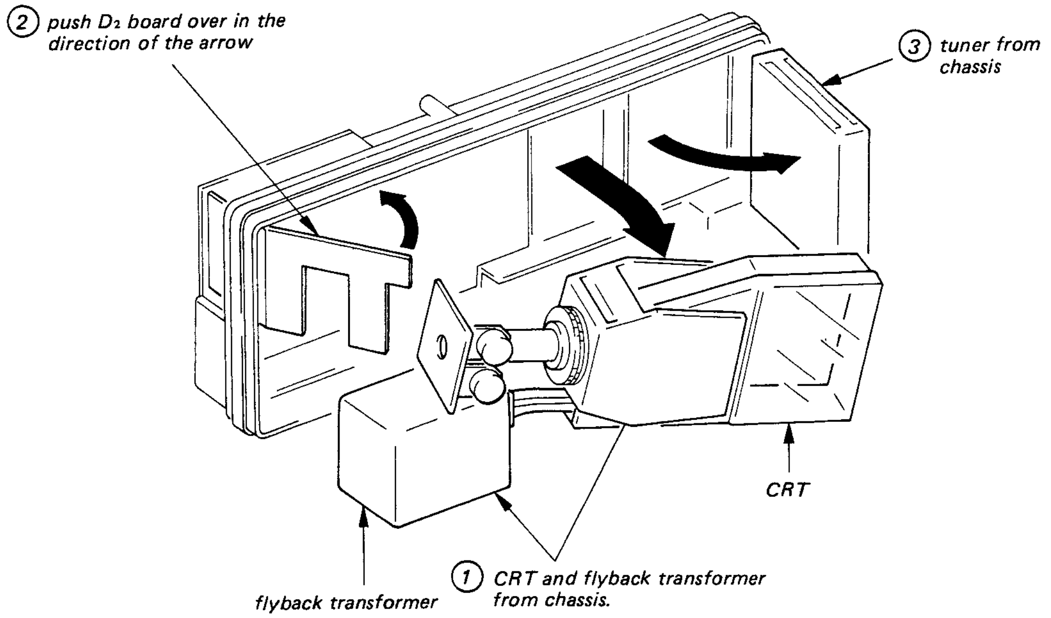
A BOARD CHECKING (1)


As shown, grasp the indicator with radio pliers and remove from the slide volume.

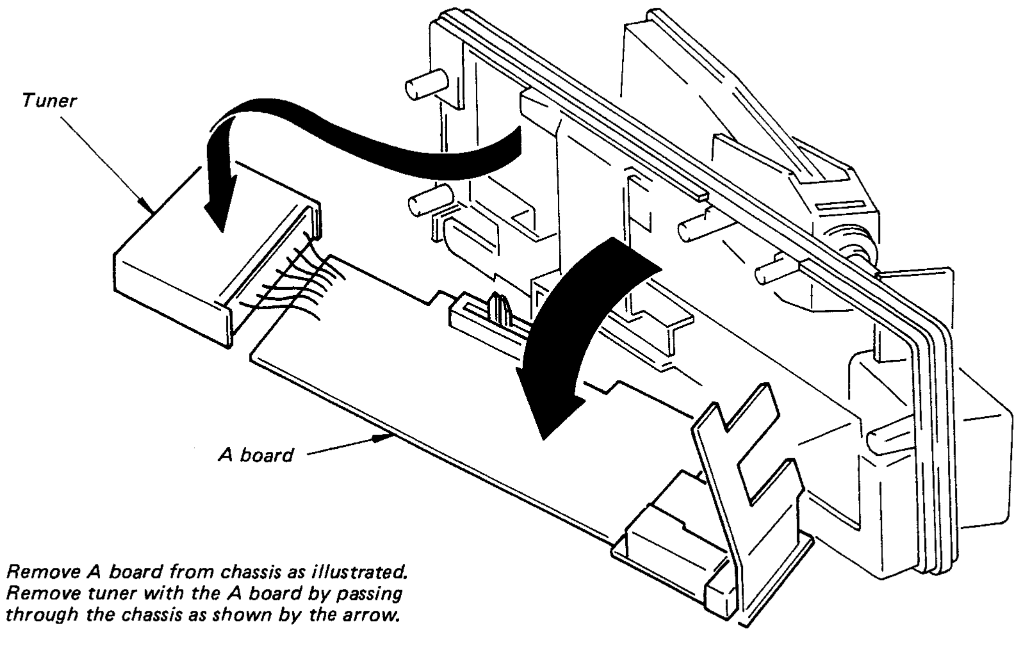
(Be careful not to stretch the springs)

radio pliers
① one screw (P1.4 x 2.5)
② mask
③ indicator from A board slide volume
④ one screw (P2 x 8)
⑤ FBT holders
⑥ CRT holders
⑦ one screw (P2 x 6)
⑧ stand D₂ board up as illustrated

A BOARD CHECKING (3)


② push D_2 board over in the direction of the arrow
③ tuner from chassis
CRT
① CRT and flyback transformer from chassis.
flyback transformer

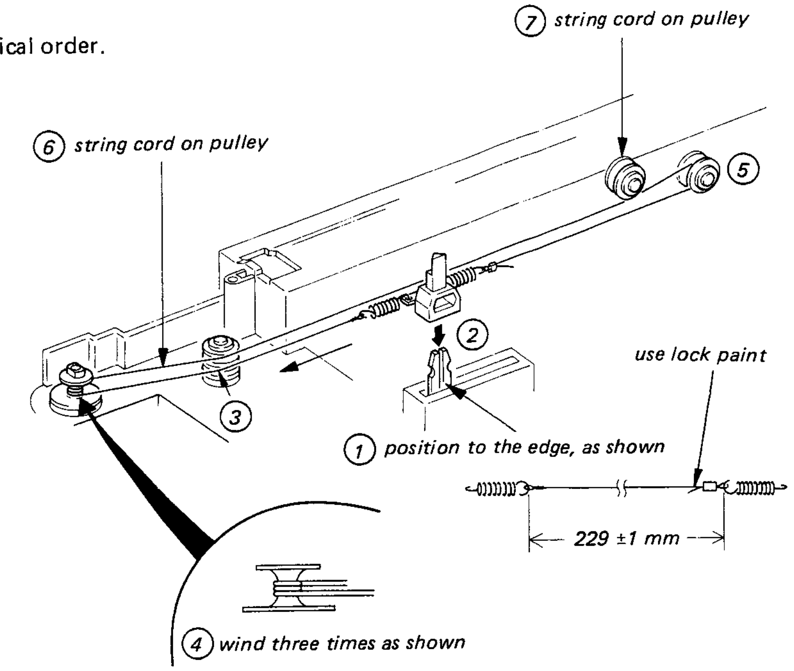
A BOARD CHECKING (4)


Tuner
A board

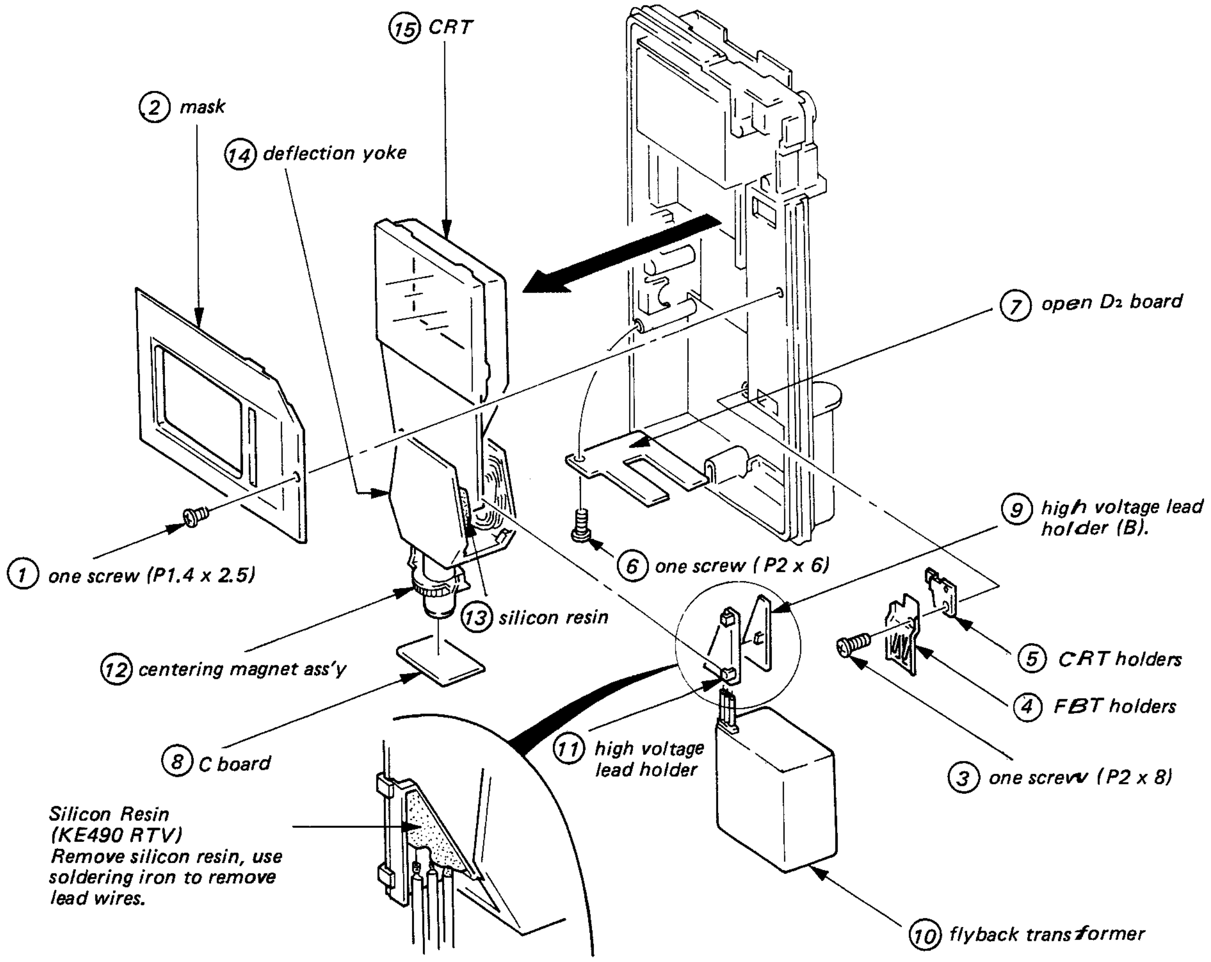
Remove A board from chassis as illustrated. Remove tuner with the A board by passing through the chassis as shown by the arrow.

CORD STRINGING

- Perform in numerical order.

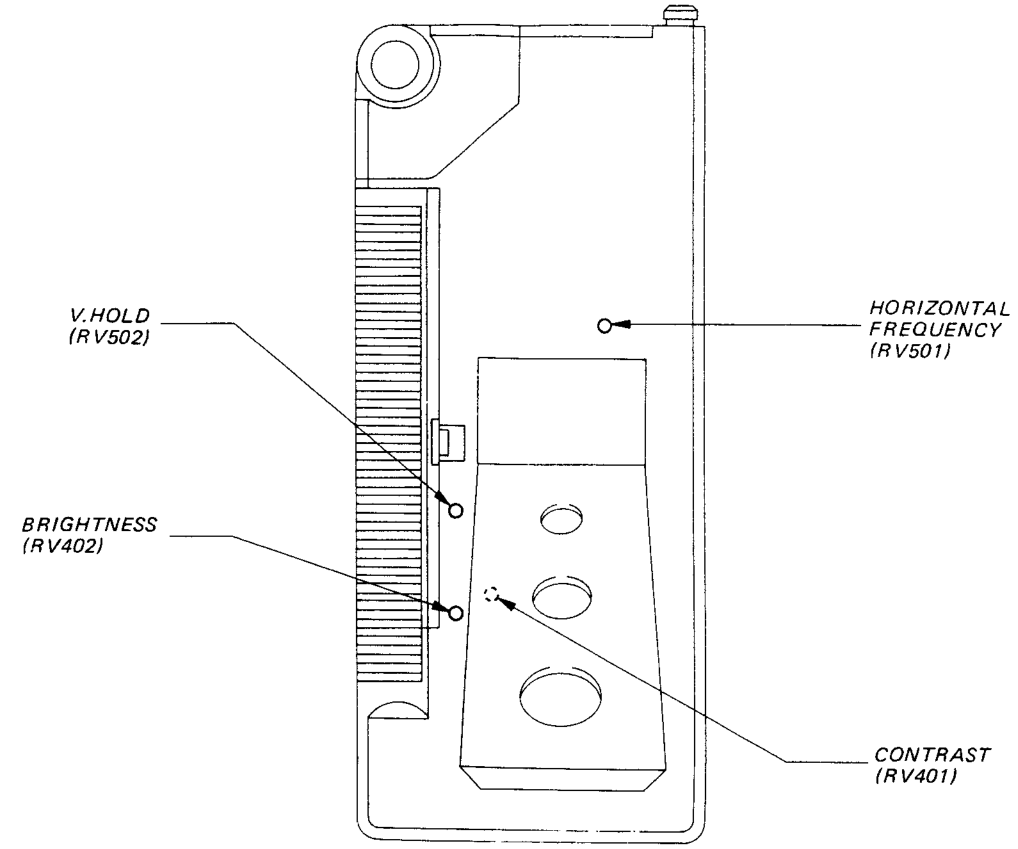

⑦ string cord on pulley
⑥ string cord on pulley
⑤
②
use lock paint
③
① position to the edge, as shown
229 ±1 mm
④ wind three times as shown

REMOVAL OF CRT


⑮ CRT
② mask
⑭ deflection yoke
⑦ open D_2 board
⑨ high voltage lead holder (B).
① one screw (P1.4 x 2.5)
⑥ one screw (P2 x 6)
⑬ silicon resin
⑫ centering magnet ass'y
⑤ CRT holders
④ FBT holders
⑧ C board
⑪ high voltage lead holder
③ one screw (P2 x 8)
⑩ flyback transformer

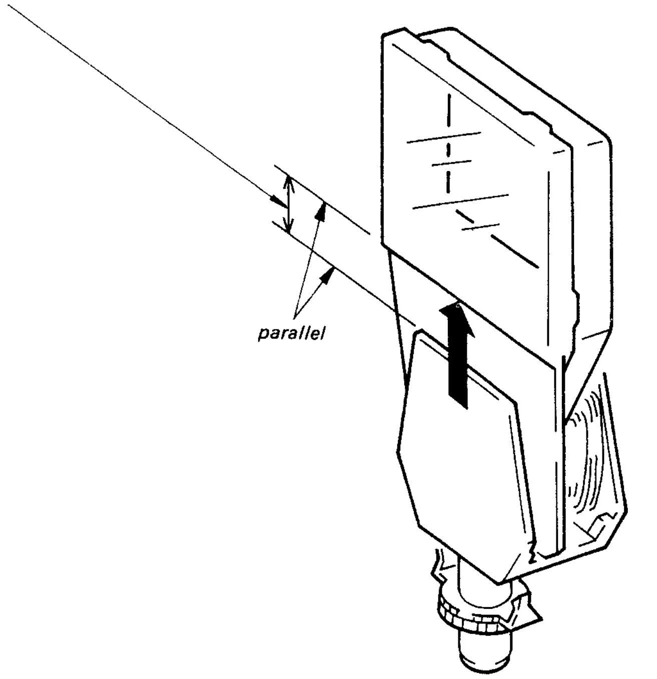
Silicon Resin (KE490 RTV) Remove silicon resin, use soldering iron to remove lead wires.

CONTROL VOLUMES


V.HOLD
(RV502)
BRIGHTNESS
(RV402)
HORIZONTAL
FREQUENCY
(RV501)
CONTRAST
(RV401)

DEFLECTION YOKE MOUNTING

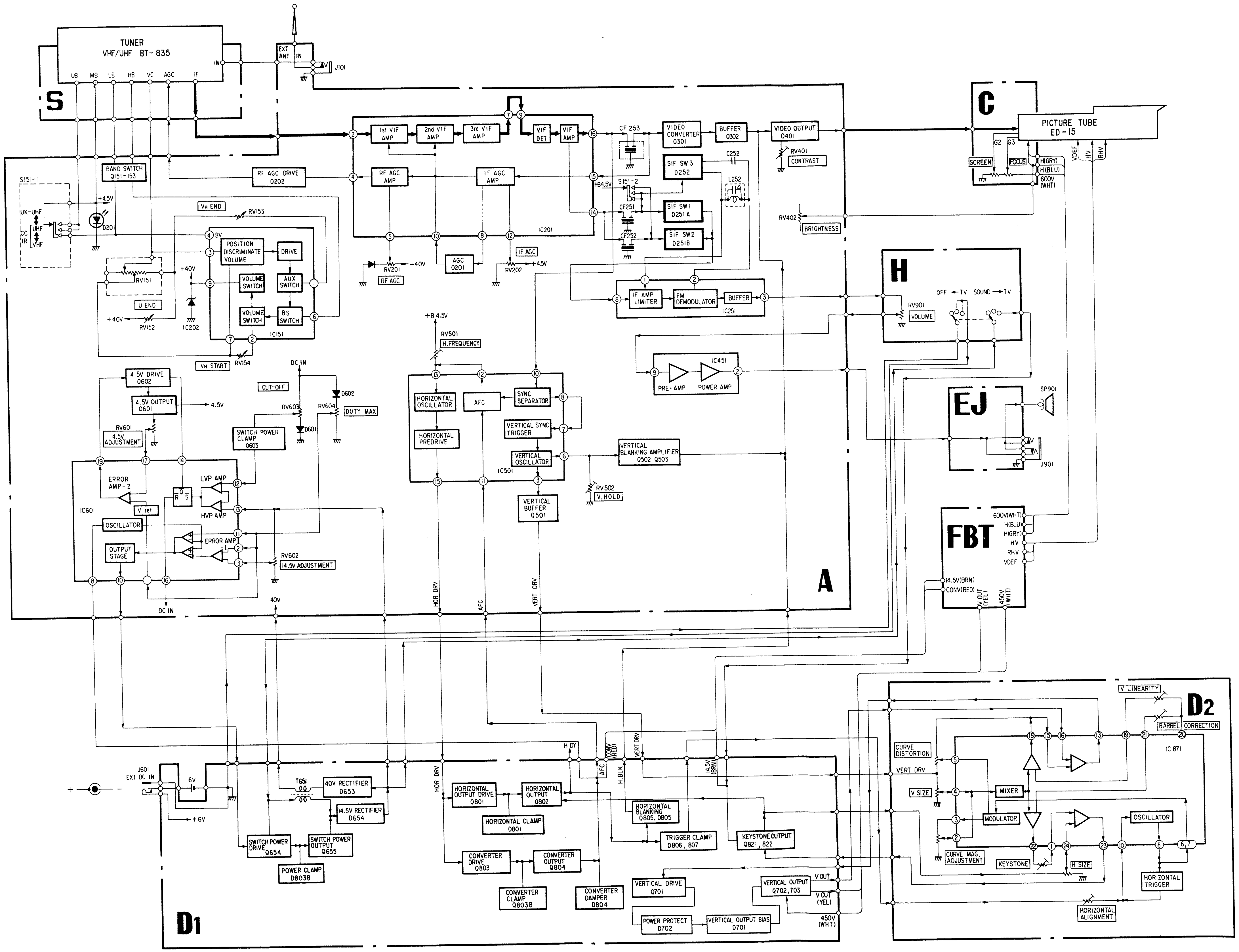
Insert the deflection yoke fully into the CRT in the direction of the arrow, and fix with silicon resin (KE490RTV) so that the two lines shown are parallel.



SECTION 3

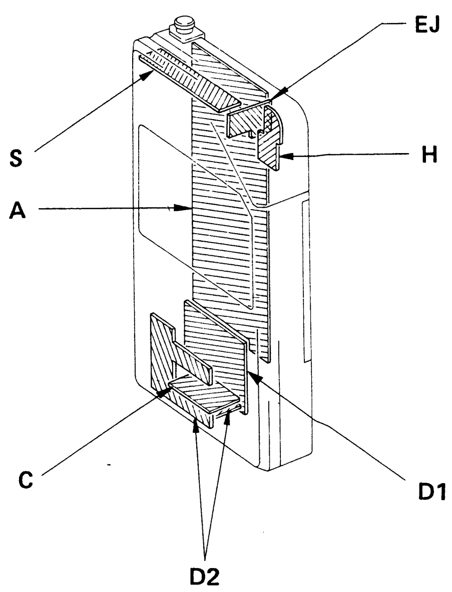
DIAGRAMS AND CIRCUIT BOARDS LOCATION

3-1. BLOCK DIAGRAM



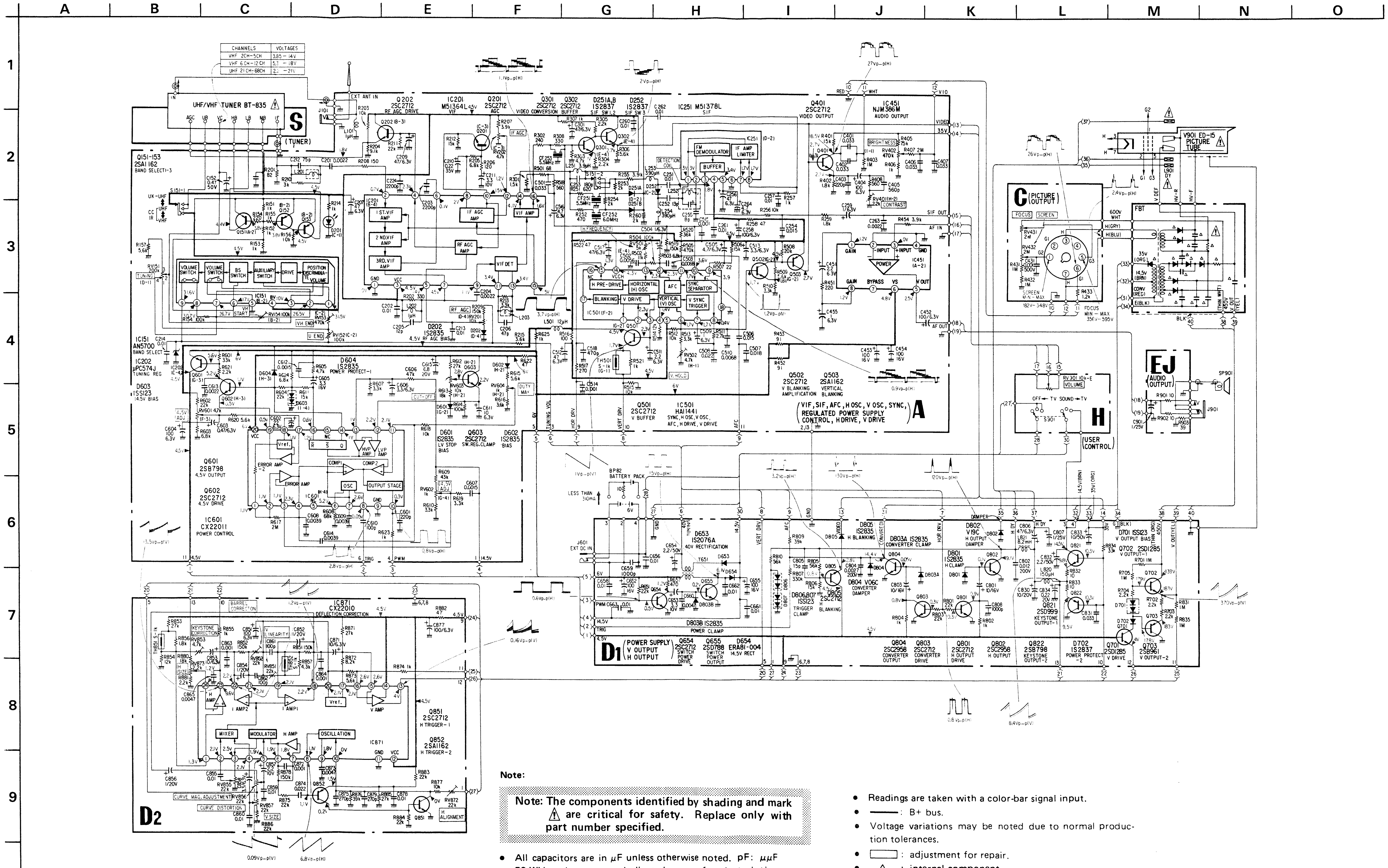
S
TUNER
VHF/UHF BT-835
UB MB LB HB VC AGC IF
IN
EXT ANT
IN
J101
BAND SWITCH
Q151-153
RF AGC DRIVE
Q202
S151-1
UK-UHF
CC
IR
UHF
LVHF
+4.5V
D201
V H END
RV153
POSITION DISCRIMINATE VOLUME
DRIVE
VOLUME SWITCH
AUX SWITCH
VOLUME SWITCH
BS SWITCH
IC151
+40V
RV151
U END
+40V
RV152
IC202
V H START
RV154
1st VIF AMP
2nd VIF AMP
3rd VIF AMP
VIF DET
VIF AMP
RF AGC AMP
IF AGC AMP
IC201
RV201
RF AGC
+40V
AGC
Q201
IF AGC
+4.5V
RV202
CF 253
VIDEO CONVERTER
Q301
BUFFER
Q302
VIDEO OUTPUT
Q401
RV401
CONTRAST
SIF SW3
D252
C252
L252
+B4.5V
S151-2
CF251
SIF SW1
D251A
CF252
SIF SW2
D251B
RV402
BRIGHTNESS
IF AMP LIMITER
FM DEMODULATOR
BUFFER
IC251
IC451
PRE-AMP
POWER AMP
C
PICTURE TUBE
ED-15
SCREEN
G2 G3
FOCUS
H(GRY)
H(BLU)
600V (WHT)
VDEF
HV
RHV
H
RV901
VOLUME
OFF ← TV SOUND → TV
EJ
SP901
J901
FBT
600V(WHT)
H(BLU)
H(GRY)
HV
RHV
VDEF
14.5V(BRN)
CONV(RED)
V OUT (YEL)
450V (WHT)
+B 4.5V
RV501
H.FREQUENCY
HORIZONTAL OSCILLATOR
AFC
SYNC SEPARATOR
HORIZONTAL PREDRIVE
VERTICAL SYNC TRIGGER
VERTICAL OSCILLATOR
IC501
VERTICAL BLANKING AMPLIFIER
Q502 Q503
RV502
V.HOLD
VERTICAL BUFFER
Q501
HOR DRV
AFC
VERT DRV
4.5V DRIVE
Q602
4.5V OUTPUT
Q601
4.5V
RV601
4.5V ADJUSTMENT
CUT-OFF
DC IN
RV603
RV604
D602
DUTY MAX
D601
SWITCH POWER CLAMP
Q603
ERROR AMP-2
LVP AMP
HVP AMP
V ref
OSCILLATOR
ERROR AMP
OUTPUT STAGE
IC601
RV602
14.5V ADJUSTMENT
DC IN
40V
A
J601
EXT DC IN
6V
+6V
T651
40V RECTIFIER
D653
14.5V RECTIFIER
D654
SWITCH POWER DRIVE
Q654
SWITCH POWER OUTPUT
Q655
POWER CLAMP
D803B
HOR DRV
HORIZONTAL OUTPUT DRIVE
Q801
HORIZONTAL OUTPUT
Q802
HORIZONTAL CLAMP
D801
H DY
AFC
H.BLK
CONV (RED)
VERT DRV
14.5V (BRN)
HORIZONTAL BLANKING
Q805, D805
TRIGGER CLAMP
D806, 807
KEYSTONE OUTPUT
Q821, 822
CONVERTER DRIVE
Q803
CONVERTER OUTPUT
Q804
CONVERTER CLAMP
Q803B
CONVERTER DAMPER
D804
VERTICAL DRIVE
Q701
VERTICAL OUTPUT
Q702,703
V OUT
V OUT (YEL)
450V (WHT)
POWER PROTECT
D702
VERTICAL OUTPUT BIAS
D701
D1
D2
V LINEARITY
BARREL CORRECTION
IC 871
CURVE DISTORTION
VERT DRV
V SIZE
MIXER
MODULATOR
OSCILLATOR
CURVE MAG. ADJUSTMENT
KEYSTONE
H SIZE
HORIZONTAL TRIGGER
HORIZONTAL ALIGNMENT

3-2. CIRCUIT BOARDS LOCATION



EJ
S
H
A
C
D1
D2

3-3. SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
1
2
3
4
5
6
7
8
9
10
CHANNELS
VOLTAGES
VHF 2CH~5CH
VHF 6CH~12CH
UHF 21CH~68CH
UHF/VHF TUNER BT-835
S
(TUNER)
Q151-153 2SA1162 BAND SELECT1-3
IC151 AN5700 BAND SELECT
IC202 μPC574J TUNING REG
D603 1SS123 14.5V BIAS
Q202 2SC2712 RF AGC DRIVE
IC201 M51364L VIF
Q201 2SC2712 AGC
Q301 2SC2712 VIDEO CONVERSION
Q302 2SC2712 BUFFER
D251A,B 1S2837 SIF SW1,2
D252 1S2837 SIF SW3
IC251 M51378L SIF
Q401 2SC2712 VIDEO OUTPUT
IC451 NJM386M AUDIO OUTPUT
1ST.VIF AMP
2ND.VIF AMP
3RD.VIF AMP
IF AGC AMP
RF AGC AMP
VIF AMP
VIF DET
FM DEMODULATOR
IF AMP LIMITER
BUFFER
BRIGHTNESS
CONTRAST
VOLUME SWITCH
BS SWITCH
AUXILIARY SWITCH
DRIVE
POSITION DISCRIMINATE
H PRE-DRIVE
HORIZONTAL (H) OSC
AFC
SYNC SEPARATOR
BLANKING
V DRIVE
VERTICAL (V) OSC
V SYNC TRIGGER
IC501 (F-2)
Q501 2SC2712 V BUFFER
IC501 HA11441 SYNC,H OSC,V OSC, AFC,H DRIVE,V DRIVE
Q502 2SC2712 V BLANKING AMPLIFICATION
Q503 2SA1162 VERTICAL BLANKING
(VIF,SIF,AFC,H OSC,V OSC,SYNC, REGULATED POWER SUPPLY CONTROL, H DRIVE, V DRIVE) A
D604 1S2835 POWER PROTECT-1
Q601 2SB798 4.5V OUTPUT
Q602 2SC2712 4.5V DRIVE
IC601 CX22011 POWER CONTROL
D601 1S2835 LV STOP BIAS
Q603 2SC2712 SW.REG.CLAMP
D602 1S2835 BIAS
ERROR AMP
COMP1
COMP2
OSC
OUTPUT STAGE
C (PICTURE OUTPUT)
FOCUS
SCREEN
V901 ED-15 PICTURE TUBE
FBT
EJ (AUDIO OUTPUT)
SP901
J901
H
RV301 10k-E VOLUME
OFF ← TV SOUND → TV
(USER CONTROL)
BP82 BATTERY PACK
J601 EXT DC IN
D653 1S2076A 40V RECTIFICATION
D805 1S2835 H BLANKING
D803A 1S2835 CONVERTER CLAMP
D802 V19C H OUTPUT DAMPER
D701 1SS123 V OUTPUT BIAS
Q702 2SD1285 V OUTPUT-1
D801 1S2835 H CLAMP
D804 V06C CONVERTER DAMPER
D806,807 1SS123 TRIGGER CLAMP
D803B 1S2835 POWER CLAMP
D1 (POWER SUPPLY V OUTPUT H OUTPUT)
Q654 2SC2712 SWITCH POWER DRIVE
Q655 2SD798 SWITCH POWER OUTPUT
D654 ERA81-004 14.5V RECT
Q804 2SC2958 CONVERTER OUTPUT
Q803 2SC2712 CONVERTER DRIVE
Q801 2SC2712 H OUTPUT DRIVE
Q802 2SC2958 H OUTPUT
Q822 2SB798 KEYSTONE OUTPUT-2
D702 1S2837 POWER PROTECT-2
Q701 2SD1285 V DRIVE
Q703 2SB961 V OUTPUT-2
Q821 2SD999 KEYSTONE OUTPUT-1
IC871 CX22010 DEFLECTION CORRECTION
BARREL CORRECTION
KEYSTONE CORRECTION
V LINEARITY
H SIZE
H AMP
I AMP2
I AMP1
V AMP
MIXER
MODULATOR
H AMP
OSCILLATION
Q851 2SC2712 H TRIGGER-1
Q852 2SA1162 H TRIGGER-2
CURVE MAG. ADJUSTMENT
CURVE DISTORTION
V SIZE
H ALIGNMENT
D2

Note:

Note: The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

- All capacitors are in μF unless otherwise noted. pF: μμF 50 WV or less are not indicated except for electrolytics.
- All resistors are in ohms, 1/8 W unless otherwise noted. k: 1000 Ω, M: 1000 kΩ
- A, D1 and D2 boards uses chip resistors and capacitors.
- Readings are taken with a 10 M ohm digital multimeter.

- Readings are taken with a color-bar signal input.
- ——: B+ bus.
- Voltage variations may be noted due to normal production tolerances.
- ▭ : adjustment for repair.
- △ : internal component.
- ▭ : panel designation.
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
- Voltages are dc with respect to ground unless otherwise noted.

Index of A board

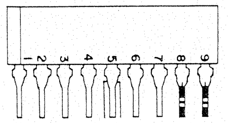
- Semiconductors and variable resistors of the A board in the schematic diagram have parts location index as shown below.

  example: Q153 (A-3)

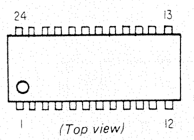
  └── shows index
- Please use these index with mounting diagram to find parts position.

3-4. SEMICONDUCTORS

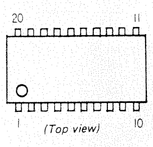
AN5700



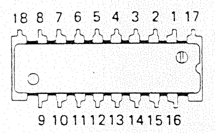
CX22010


24
13
1
(Top view)
12

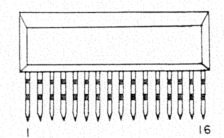
CX22011


20
11
1
(Top view)
10

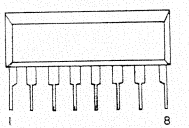
HA11441


18 8 7 6 5 4 3 2 1 17
9 10 11 12 13 14 15 16

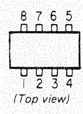
M51364L



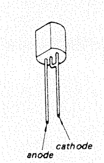
M51378L



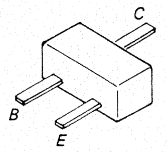
NJM386M


8 7 6 5
1 2 3 4
(Top view)

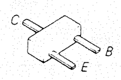
μPC574J


cathode
anode

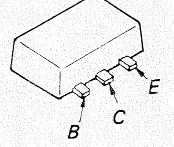
2SA812
2SC1623
2SC2712
2SC2812



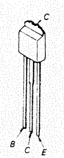
2SA1162



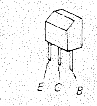
2SB798
2SD999



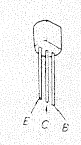
2SB961
2SD1285



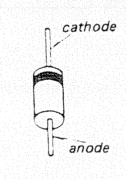
2SC2958



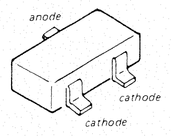
2SD788



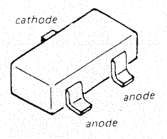
1S2076A


cathode
anode

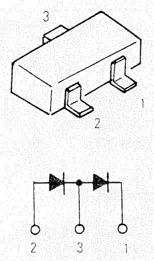
1S2835


anode
cathode
cathode

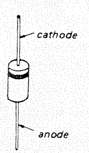
1S2837


cathode
anode
anode

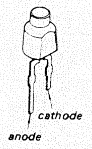
1SS123



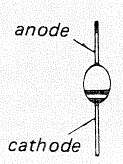
ERA81-004


cathode
anode

TLG226


cathode
anode

V06C
V19C
V19E


anode
cathode

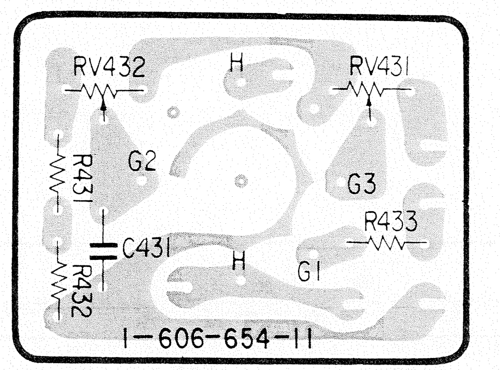
3-5. PRINTED WIRING BOARDS

– Conductor Side –

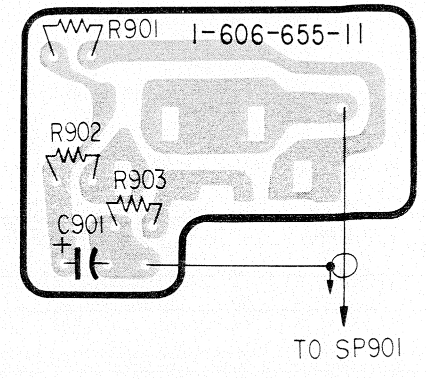
●—● : jumper wire

A B C D E F G

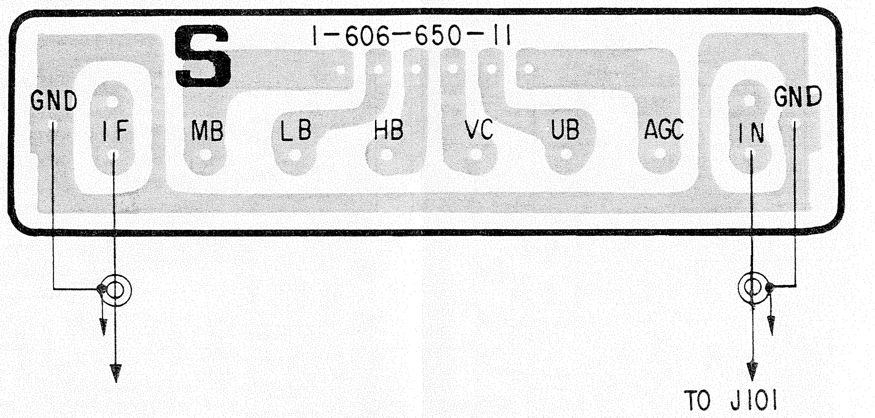
– C Board –


RV432
H
RV431
R431
G2
G3
R433
C431
H
G1
R432
1-606-654-11

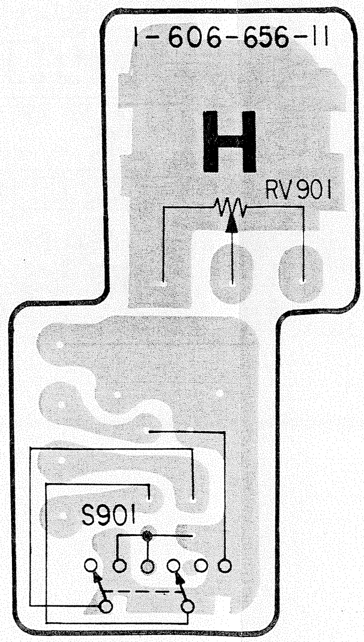
– EJ Board –


R901
1-606-655-11
R902
R903
C901
TO SP901

– S Board –


S
1-606-650-11
GND
IF
MB
LB
HB
VC
UB
AGC
IN
GND
TO J101

– H Board –


1-606-656-11
H
RV901
S901

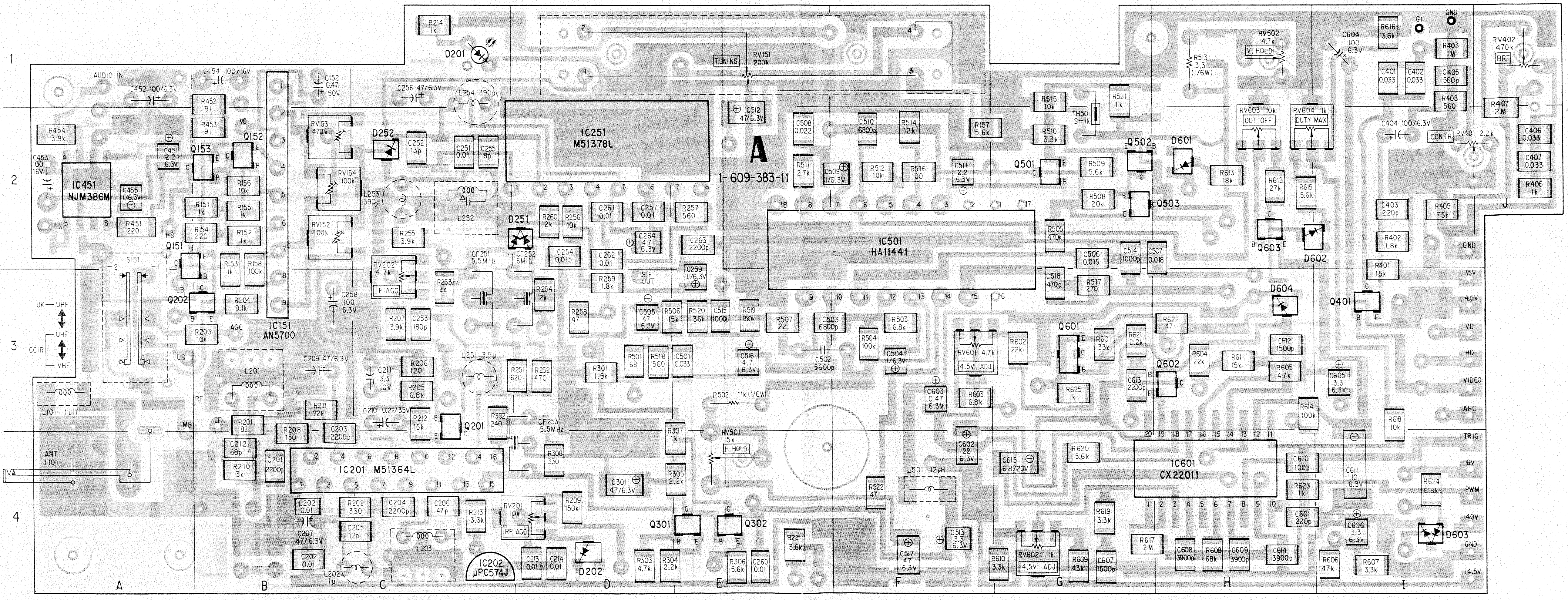
A

A [VIF, SIF, SYNCSEP PROTECTOR]

– A Board –

- [R000] : chip resistor, [C000] : chip capacitor

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Q · IC		IC451	151 153 202 152	IC151	201	IC202 IC251	301	302	IC501		501 601 502 503	602 603	401		
D					252 201	251 202						601	604 602	603	
ADJ				RV154 RV153 RV152	RV202	RV201		RV151 RV501		RV601 RV602		RV502 RV603	RV604	RV401	RV402

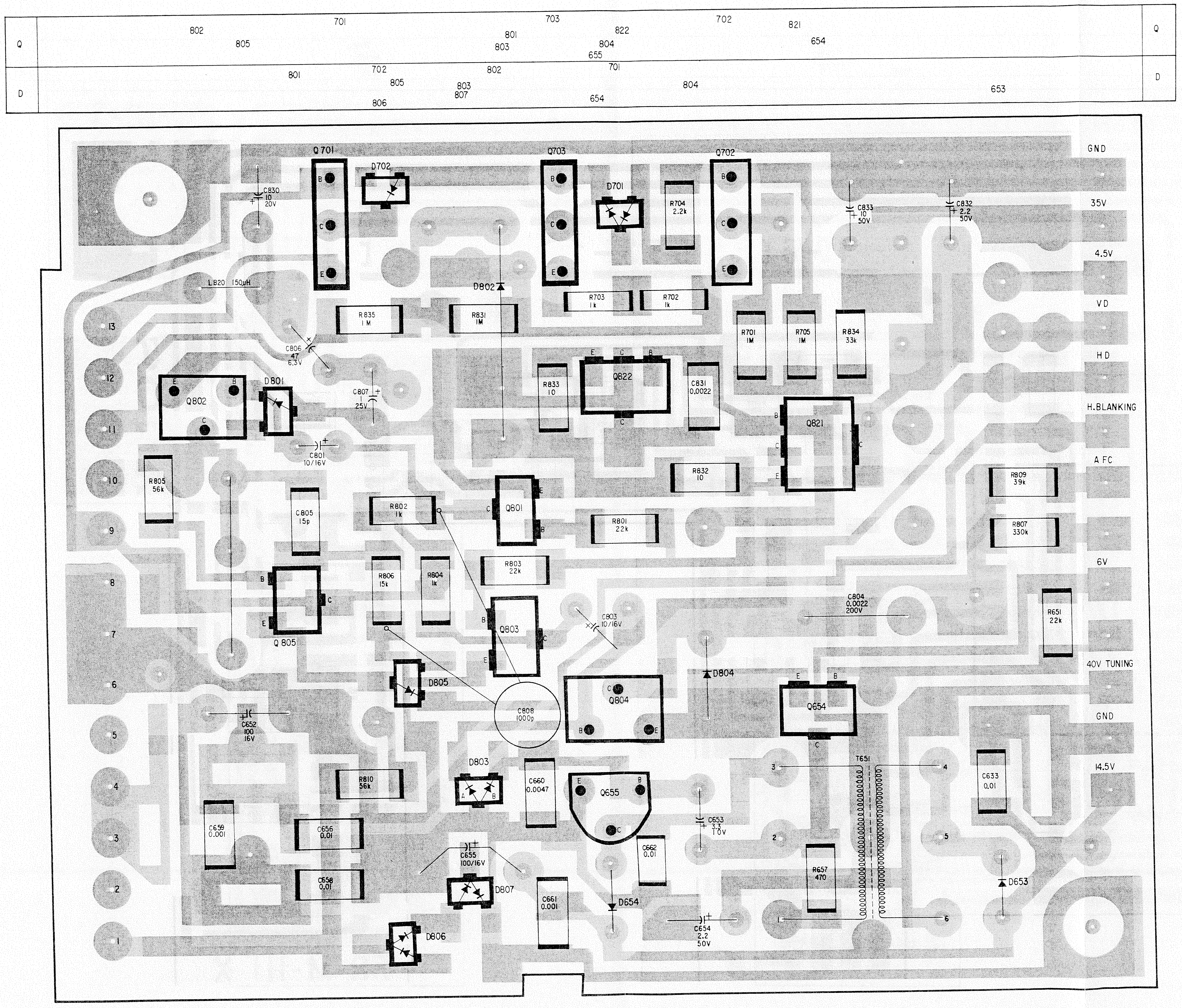


IC451 NJM386M
IC151 AN5700
IC201 M51364L
IC202 μPC574J
IC251 M51378L
IC501 HA11441
IC601 CX22011
1-609-383-11
AUDIO IN
ANT J101
TUNING
V. HOLD
H. HOLD
OUT OFF
DUTY MAX
CONTR
BRT
IF AGC
RF AGC
4.5V ADJ
14.5V ADJ
GND
35V
4.5V
VD
HD
VIDEO
AFC
TRIG
6V
PWM
40V
14.5V
UK
UHF
VHF
CCIR

D1 **D1** DEFLECTION (V.H)
WAVEFORM CIRCUIT
POWER

A B C D E F G H I J K L M N O

– D1 Board – • R000 : chip resistor, C000 : chip capacitor


Q
802
805
701
801
803
703
822
804
655
702
821
654
D
801
702
805
803
807
806
802
701
654
804
653
Q701
D702
C830 10 20V
Q703
D701
R704 2.2k
Q702
C833 10 50V
C832 2.2 50V
GND
35V
4.5V
VD
HD
H.BLANKING
AFC
6V
40V TUNING
GND
14.5V
L820 150μH
D802
R835 1M
R831 1M
R703 1k
R702 1k
R701 1M
R705 1M
R834 33k
C806 47 6.3V
C807 25V
R833 10
Q822
C831 0.0022
Q821
Q802
D801
C801 10/16V
R832 10
R809 39k
R807 330k
R805 56k
C805 15p
R802 1k
Q801
R801 22k
R803 22k
R806 15k
R804 1k
Q805
Q803
C803 10/16V
C804 0.0022 200V
R651 22k
D804
Q804
Q654
D805
C808 1000p
C652 100 16V
T651
R810 56k
D803
C660 0.0047
Q655
C633 0.01
C653 3.3 10V
C659 0.001
C656 0.01
C658 0.01
C655 100/16V
C662 0.01
R657 470
D653
D807
C661 0.001
D654
C654 2.2 50V
D806
13
12
11
10
9
8
7
6
5
4
3
2
1
B
C
E

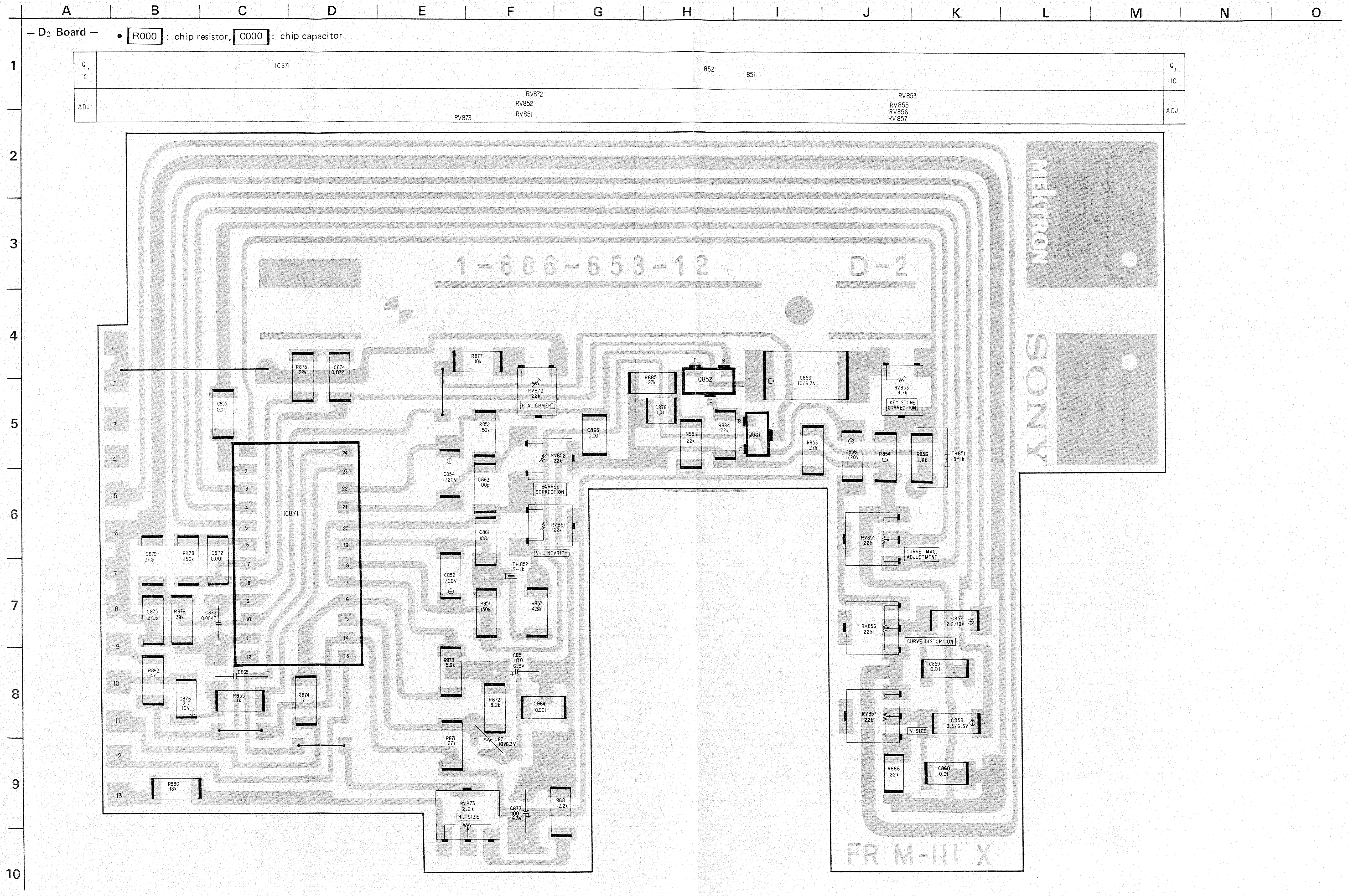
1 2 3 4 5 6 7 8 9 10

D2　**D2** WAVEFORM PROCESSING

– D₂ Board –

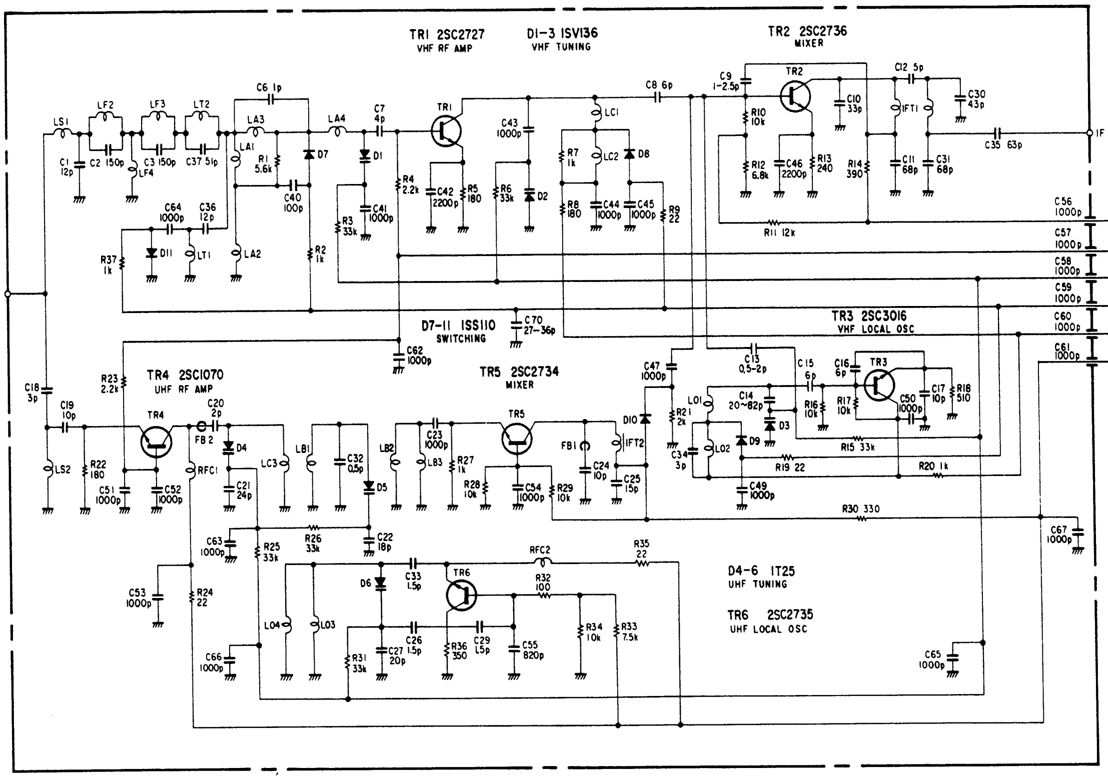
• R000 : chip resistor, C000 : chip capacitor

Q, IC	IC871	852 851
ADJ	RV873 RV872 RV852 RV851	RV853 RV855 RV856 RV857


A B C D E F G H I J K L M N O
1 2 3 4 5 6 7 8 9 10
1-606-653-12
D-2
MEKTRON
SONY
FR M-III X
1 2 3 4 5 6 7 8 9 10 11 12 13
R875 22k
C874 0.022
R877 10k
RV872 22k
H. ALIGNMENT
R885 27k
Q852
E B C
C853 10/6.3V
RV853 4.7k
KEY STONE CORRECTION
C855 0.01
R852 150k
C878 0.01
C863 0.001
R883 22k
R884 22k
Q851
R853 27k
C856 1/20V
R854 12k
R856 1.8k
TH851 S-1k
C854 1/20V
C862 100p
RV852 22k
BARREL CORRECTION
IC871
C861 100p
RV851 22k
V. LINEARITY
RV855 22k
CURVE MAG. ADJUSTMENT
C879 270p
R878 150k
C872 0.001
C852 1/20V
TH852 S-1k
R851 150k
R857 4.3k
C875 270p
R876 39k
C873 0.0047
RV856 22k
CURVE DISTORTION
C857 2.2/10V
R873 5.6k
C851 100 6.3V
C859 0.01
R882 47
C865
R874 1k
R855 1k
C876 2.2 10V
R872 8.2k
C864 0.001
RV857 22k
V. SIZE
C858 3.3/6.3V
R871 27k
C871 10/6.3V
R886 22k
C860 0.01
R880 18k
RV873 2.2k
H. SIZE
C877 100 6.3V
R881 2.2k

3-6. UHF AND VHF TUNER SCHEMATIC DIAGRAM

- **BT-835**


TR1 2SC2727
VHF RF AMP
D1-3 1SV136
VHF TUNING
TR2 2SC2736
MIXER
TR3 2SC3016
VHF LOCAL OSC
D7-11 1SS110
SWITCHING
TR4 2SC1070
UHF RF AMP
TR5 2SC2734
MIXER
D4-6 1T25
UHF TUNING
TR6 2SC2735
UHF LOCAL OSC
UHF/VHF IN
IF OUT
MB
AGC
TU
HB
EB
UB

Note: Tuner reference numbers are not included in the Electrical Parts List.

SECTION 4

EXPLODED VIEWS

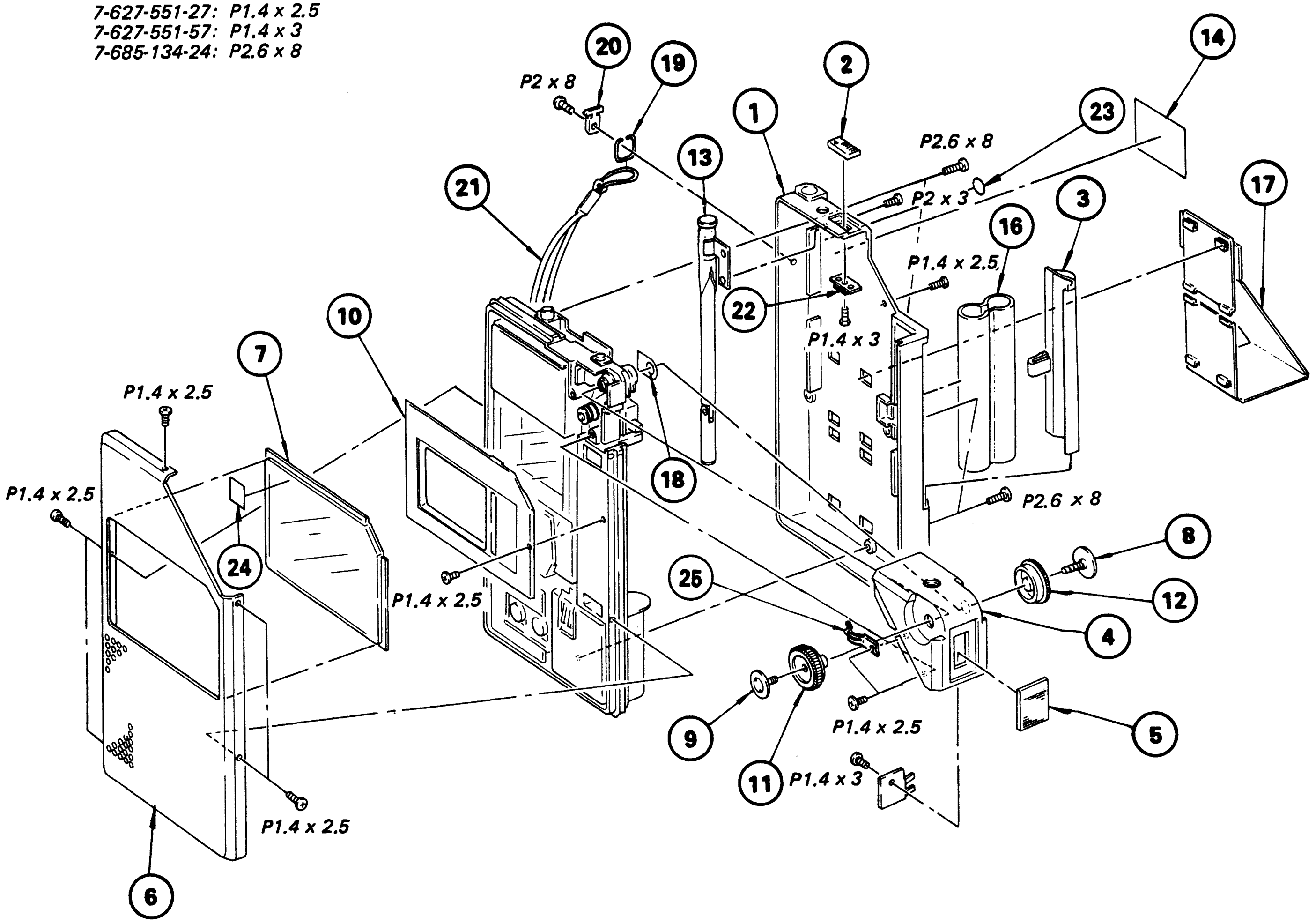
NOTE:
- Items with no part number and no description are not stocked because they are seldom required for routine service.
- The construction parts of an assembled part are indicated with a collation number in the remark column.

- Items marked " ♠ " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

(1) CABINET

7-621-255-12: P2 x 3
7-621-255-52: P2 x 8
7-627-551-27: P1.4 x 2.5
7-627-551-57: P1.4 x 3
7-685-134-24: P2.6 x 8

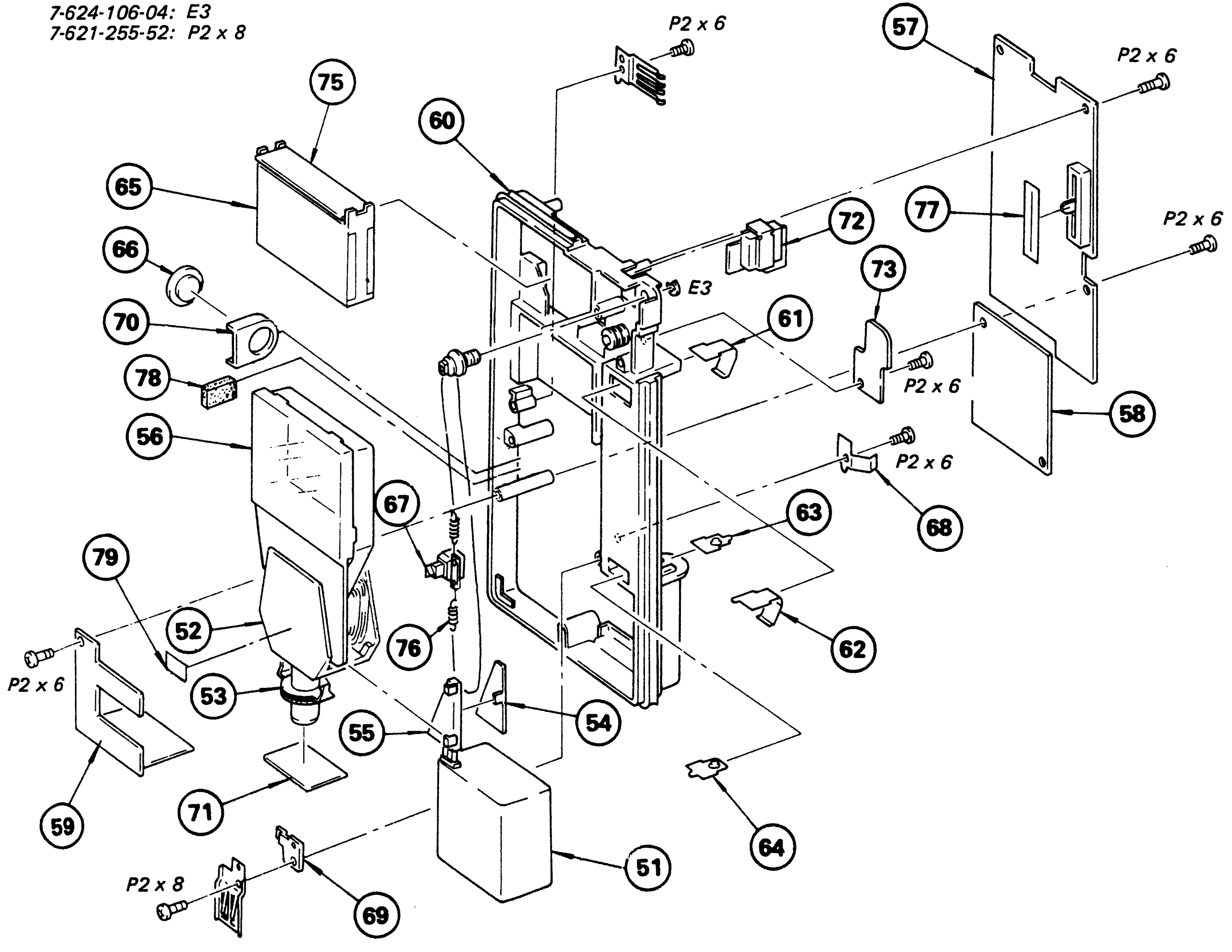

1
2
3
4
5
6
7
8
9
10
11
12
13
14
16
17
18
19
20
21
22
23
24
25
P2 x 8
P2.6 x 8
P2 x 3
P1.4 x 2.5
P1.4 x 3
P2.6 x 8
P1.4 x 2.5
P1.4 x 2.5
P1.4 x 2.5
P1.4 x 2.5
P1.4 x 2.5
P1.4 x 3

No.	Part No.	Description	Remark
1	X-4026-902-6	COVER ASSY, BACK	2,3,17,22
2	4-027-415-00	KNOB, BAND	
3	4-026-921-11	LID, BATTERY CASE	
4	X-4026-903-0	BOX ASSY, CONTROL	5
5	4-026-904-00	KNOB, POWER	
6	X-4026-904-5	PLATE ASSY, ORNAMENTAL, UPPER	
7	4-026-903-00	FILTER	
8	4-026-907-00	SCREW (A), PIN-FACE	
9	4-026-908-00	SCREW (B), PIN-FACE	
10	4-026-922-21	MASK	
11	4-026-923-00	KNOB, TUNING	

No.	Part No.	Description	Remark
12	4-026-924-00	KNOB, CONTROL	
13	1-501-199-21	ANTENNA, TELESCOPIC	
14	♠:4-027-417-00	LABEL, MODEL NUMBER	
16	4-026-947-00	TUBE, BATTERY	
17	4-026-937-11	STAND	
18	♠:4-026-942-00	PLATE, BLIND, CONTROL, SOUND	
19	3-570-727-00	RING, HAND STRAP	
20	3-570-728-00	BRACKET, HAND STRAP	
21	3-570-888-00	STRAP, HAND	
22	♠:4-027-416-00	PLATE, FUNCTION, BAND SWITCH	
23	3-701-940-01	LABEL, BEAB (UK MODEL ONLY)	
24	3-703-710-01	STICKER, SONY SYMBOL (12)	
25	♠ 4-027-418-00	PLATE, GROUND	

(2) CRT

7-685-104-21: P2 x 6
7-624-106-04: E3
7-621-255-52: P2 x 8



No.	Part No.	Description	Remark
51	⚠.1-439-291-00	TRANSFORMER ASSY, FLYBACK	
52	⚠.1-451-213-00	DEFLECTION YOKE	
53	1-452-265-00	MAGNET ASSY, CENTERING	
54	●:4-026-929-00	RETAINER (B), HIGH-VOLTAGE LEAD	
55	●:4-026-934-00	RETAINER (A), HIGH-VOLTAGE LEAD	
56	⚠.8-733-651-05	CRT, ED-15 (02PM)	
57	●:A-1295-676-A	A BOARD, COMPLETE	
58	●:A-1345-407-A	D1 BOARD, COMPLETE	
59	●:A-1345-410-A	D2 BOARD, COMPLETE	
60	X-4026-901-4	CHASSIS ASSY	61,62,63,64
61	4-026-916-00	TERMINAL (B), BATTERY	
62	4-026-917-00	TERMINAL (C), BATTERY	
63	4-026-918-00	TERMINAL (D), BATTERY	
64	4-026-919-00	TERMINAL (E), BATTERY	
65	⚠.1-463-450-00	TUNER (BT-835)	
66	1-503-120-00	SPEAKER (023F006)	
67	4-026-906-00	POINTER	
68	4-026-915-00	TERMINAL (A), BATTERY	
69	●:4-026-930-00	RETAINER, CRT	
70	●:4-026-938-00	RETAINER, SPEAKER	
71	●:1-606-654-00	C BOARD	
72	●:1-606-655-00	EJ BOARD	
73	●:1-606-656-00	H BOARD	
75	●:1-606-650-00	S BOARD	
76	3-547-660-02	SPRING, TENSION	
77	●:4-026-943-00	PLATE, BLIND, CONTROL, SLIDE	
78	9-911-841-XX	RETAINER, FE	
79	9-911-837-XX	CUSHION, FILTER	

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

A

SECTION 5

ELECTRICAL PARTS LIST

NOTE:

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.

CAPACITORS
- MF : μF, PF : μμF

RESISTORS
- All resistors are in ohms
- F : nonflammable

COILS
- MMH : mH, UH : μH

- Items marked "●" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

When indicating parts by reference number, please include the board name.

Ref.No.	Part No.	Description	Remark
	●:A-1295-676-A	A BOARD, COMPLETE *****************	
	●:4-026-910-00	HOLDER, LED	
	●:4-027-420-00	PLATE, SHIELD	
		CAPACITOR	
C152	1-123-610-00	ELECT 0.47MF	20% 50V
C201	1-163-051-91	CERAMIC CHIP 0.0022MF	10% 50V
C202	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C203	1-163-051-91	CERAMIC CHIP 0.0022MF	10% 50V
C204	1-163-051-91	CERAMIC CHIP 0.0022MF	10% 50V
C205	1-163-289-00	CERAMIC CHIP 12PF	5% 50V
C206	1-163-303-91	CERAMIC CHIP 47PF	5% 50V
C207	1-123-647-00	ELECT 47MF	20% 6.3V
C209	1-131-387-00	TANTALUM 47MF	20% 6.3V
C210	1-131-343-00	TANTALUM 0.22MF	20% 35V
C211	1-131-368-00	TANTALUM 3.3MF	20% 10V
C212	1-163-308-00	CERAMIC CHIP 75PF	5% 50V
C213	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C214	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C251	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C252	1-163-410-00	CERAMIC CHIP 13PF	5% 50V
C253	1-163-187-00	CERAMIC CHIP 180PF	5% 50V
C254	1-163-061-91	CERAMIC CHIP 0.015MF	10% 50V
C255	1-163-405-91	CERAMIC CHIP 8PF	0.25PF 50V
C256	1-123-647-00	ELECT 47MF	20% 6.3V
C257	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C258	1-123-661-00	ELECT 100MF	20% 6.3V
C259	1-135-007-00	TANTAL. CHIP 1MF	20% 6.3V
C260	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C261	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C262	1-163-059-91	CERAMIC CHIP 0.01MF	10% 50V
C263	1-163-051-91	CERAMIC CHIP 0.0022MF	10% 50V
C264	1-135-010-00	TANTAL. CHIP 4.7MF	20% 6.3V
C301	1-135-013-00	TANTAL. CHIP 47MF	20% 6.3V
C401	1-163-078-91	CERAMIC CHIP 0.033MF	10% 25V
C402	1-163-078-91	CERAMIC CHIP 0.033MF	10% 25V
C403	1-163-189-91	CERAMIC CHIP 220PF	5% 50V
C404	1-123-661-00	ELECT 100MF	20% 6.3V
C405	1-163-199-91	CERAMIC CHIP 560PF	5% 50V
C406	1-163-078-91	CERAMIC CHIP 0.033MF	10% 25V
C407	1-163-078-91	CERAMIC CHIP 0.033MF	10% 25V
C451	1-135-008-00	TANTAL. CHIP 2.2MF	20% 6.3V
C452	1-123-661-00	ELECT 100MF	20% 6.3V
C453	1-123-995-00	ELECT 100MF	20% 16V
C454	1-123-995-00	ELECT 100MF	20% 16V
C455	1-135-007-00	TANTAL. CHIP 1MF	20% 6.3V
C501	1-163-078-91	CERAMIC CHIP 0.033MF	10% 25V
C502	1-130-868-00	FILM 0.0056MF	5% 50V
C503	1-163-057-91	CERAMIC CHIP 0.0068MF	10% 50V
C504	1-135-007-00	TANTAL. CHIP 1MF	20% 6.3V
C505	1-135-010-00	TANTAL. CHIP 4.7MF	20% 6.3V
C506	1-163-061-91	CERAMIC CHIP 0.015MF	10% 50V
C507	1-163-062-91	CERAMIC CHIP 0.018MF	10% 50V
C508	1-163-063-91	CERAMIC CHIP 0.022MF	10% 50V
C509	1-135-007-00	TANTAL. CHIP 1MF	20% 6.3V
C510	1-163-057-91	CERAMIC CHIP 0.0068MF	10% 50V
C511	1-135-008-00	TANTAL. CHIP 2.2MF	20% 6.3V
C512	1-135-013-00	TANTAL. CHIP 47MF	20% 6.3V
C513	1-135-009-00	TANTAL. CHIP 3.3MF	20% 6.3V
C514	1-163-205-91	CERAMIC CHIP 0.001MF	5% 50V
C515	1-163-205-91	CERAMIC CHIP 0.001MF	5% 50V
C516	1-135-010-00	TANTAL. CHIP 4.7MF	20% 6.3V
C517	1-135-013-00	TANTAL. CHIP 47MF	20% 6.3V
C518	1-163-197-91	CERAMIC CHIP 470PF	5% 50V
C601	1-163-189-91	CERAMIC CHIP 220PF	5% 50V
C602	1-135-012-00	TANTAL. CHIP 22MF	20% 6.3V
C603	1-135-006-00	TANTAL. CHIP 0.47MF	20% 6.3V
C604	1-123-661-00	ELECT 100MF	20% 6.3V
C605	1-135-009-00	TANTAL. CHIP 3.3MF	20% 6.3V
C606	1-135-009-00	TANTAL. CHIP 3.3MF	20% 6.3V
C607	1-163-049-91	CERAMIC CHIP 0.0015MF	10% 50V
C608	1-163-054-91	CERAMIC CHIP 0.0039MF	10% 50V
C609	1-163-054-91	CERAMIC CHIP 0.0039MF	10% 50V
C610	1-163-181-91	CERAMIC CHIP 100PF	5% 50V
C611	1-135-002-00	TANTAL. CHIP 10MF	20% 6.3V
C612	1-163-049-91	CERAMIC CHIP 0.0015MF	10% 50V
C613	1-163-051-91	CERAMIC CHIP 0.0022MF	10% 50V
C614	1-163-054-91	CERAMIC CHIP 0.0039MF	10% 50V
C615	1-135-014-00	TANTAL. CHIP 6.8MF	20% 20V
		FILTER	
CF251	1-567-099-00	FILTER, CERAMIC	
CF252	1-567-100-00	FILTER, CERAMIC	
CF253	1-409-369-00	TRAP, CERAMIC 5.5MHZ	
		DIODE	
D201	8-719-822-26	DIODE TLG226	
D202	8-719-100-03	DIODE 1S2835	
D251A,B	8-719-100-05	DIODE 1S2837	
D252	8-719-100-03	DIODE 1S2835	
D601	8-719-100-03	DIODE 1S2835	
D602	8-719-100-03	DIODE 1S2835	
D603	8-719-101-23	DIODE 1SS123	
D604	8-719-100-03	DIODE 1S2835	
		IC	
IC151	8-759-400-03	IC AN5700	
IC201	8-759-600-45	IC M51364L	
IC202	8-759-157-40	IC UPC574J	
IC251	8-759-600-46	IC M51378L	
IC451	8-759-700-50	IC NJM386M	
IC501	8-759-314-41	IC HA11441	
IC601	8-759-600-26	IC CX22011	

JACK

Ref.No.	Part No.	Description				Remark
J101	1-507-814-00	JACK, ANTENNA				

COIL

Ref.No.	Part No.	Description				Remark
L101	1-408-669-00	COIL, CHOKE				
L201	1-404-450-00	COIL, VIF				
L202	1-407-178-XX	MICRO INDUCTOR 1UH				
L203	1-404-450-00	COIL, VIF				
L251	1-407-185-XX	MICRO INDUCTOR 3.9UH				
L252	1-404-451-00	COIL, SIF				
L253	1-407-176-XX	MICRO INDUCTOR 390UH				
L254	1-407-176-XX	MICRO INDUCTOR 390UH				
L501	1-408-491-00	COIL, CHOKE				

TRANSISTOR

Ref.No.	Part No.	Description				Remark
Q151	8-729-216-22	TRANSISTOR 2SA1162				
Q152	8-729-216-22	TRANSISTOR 2SA1162				
Q153	8-729-216-22	TRANSISTOR 2SA1162				
Q201	8-729-271-23	TRANSISTOR 2SC2712				
Q202	8-729-271-23	TRANSISTOR 2SC2712				
Q301	8-729-271-23	TRANSISTOR 2SC2712				
Q302	8-729-271-23	TRANSISTOR 2SC2712				
Q401	8-729-271-23	TRANSISTOR 2SC2712				
Q501	8-729-271-23	TRANSISTOR 2SC2712				
Q502	8-729-271-23	TRANSISTOR 2SC2712				
Q503	8-729-216-22	TRANSISTOR 2SA1162				
Q601	8-729-101-07	TRANSISTOR 2SB798				
Q602	8-729-271-23	TRANSISTOR 2SC2712				
Q603	8-729-271-23	TRANSISTOR 2SC2712				

RESISTOR

Ref.No.	Part No.	Description				Remark
R151	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R152	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R153	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R154	1-216-182-81	METAL CHIP	220	5%	1/8W	
R155	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R156	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R157	1-216-216-81	METAL CHIP	5.6K	5%	1/8W	
R158	1-216-246-81	METAL CHIP	100K	5%	1/8W	
R201	1-216-172-81	METAL CHIP	82	5%	1/8W	
R202	1-216-186-81	METAL CHIP	330	5%	1/8W	
R203	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R204	1-216-221-81	METAL CHIP	9.1K	5%	1/8W	
R205	1-216-218-81	METAL CHIP	6.8K	5%	1/8W	
R206	1-216-176-81	METAL CHIP	120	5%	1/8W	
R207	1-216-212-81	METAL CHIP	3.9K	5%	1/8W	
R208	1-216-178-81	METAL CHIP	150	5%	1/8W	
R209	1-216-250-81	METAL CHIP	150K	5%	1/8W	
R210	1-216-209-81	METAL CHIP	3K	5%	1/8W	
R211	1-216-230-81	METAL CHIP	22K	5%	1/8W	
R212	1-216-226-81	METAL CHIP	15K	5%	1/8W	

Ref.No.	Part No.	Description				Remark
R213	1-216-210-81	METAL CHIP	3.3K	5%	1/8W	
R214	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R215	1-216-211-81	METAL CHIP	3.6K	5%	1/8W	
R251	1-216-193-81	METAL CHIP	620	5%	1/8W	
R252	1-216-190-81	METAL CHIP	470	5%	1/8W	
R253	1-216-205-81	METAL CHIP	2K	5%	1/8W	
R254	1-216-205-81	METAL CHIP	2K	5%	1/8W	
R255	1-216-212-81	METAL CHIP	3.9K	5%	1/8W	
R256	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R257	1-216-192-81	METAL CHIP	560	5%	1/8W	
R258	1-216-166-81	METAL CHIP	47	5%	1/8W	
R259	1-216-204-81	METAL CHIP	1.8K	5%	1/8W	
R260	1-216-205-81	METAL CHIP	2K	5%	1/8W	
R301	1-216-202-81	METAL CHIP	1.5K	5%	1/8W	
R302	1-216-183-81	METAL CHIP	240	5%	1/8W	
R303	1-216-214-81	METAL CHIP	4.7K	5%	1/8W	
R304	1-216-206-81	METAL CHIP	2.2K	5%	1/8W	
R305	1-216-206-81	METAL CHIP	2.2K	5%	1/8W	
R306	1-216-216-81	METAL CHIP	5.6K	5%	1/8W	
R307	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R308	1-216-186-81	METAL CHIP	330	5%	1/8W	
R401	1-216-226-81	METAL CHIP	15K	5%	1/8W	
R402	1-216-204-81	METAL CHIP	1.8K	5%	1/8W	
R403	1-216-270-81	METAL CHIP	1M	5%	1/8W	
R405	1-216-243-81	METAL CHIP	75K	5%	1/8W	
R406	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R407	1-216-277-81	METAL CHIP	2M	5%	1/8W	
R408	1-216-192-81	METAL CHIP	560	5%	1/8W	
R451	1-216-182-81	METAL CHIP	220	5%	1/8W	
R452	1-216-173-81	METAL CHIP	91	5%	1/8W	
R453	1-216-173-81	METAL CHIP	91	5%	1/8W	
R454	1-216-212-81	METAL CHIP	3.9K	5%	1/8W	
R501	1-216-170-81	METAL CHIP	68	5%	1/8W	
R502	1-247-856-00	CARBON	11K	5%	1/6W	
R503	1-216-218-81	METAL CHIP	6.8K	5%	1/8W	
R504	1-216-246-81	METAL CHIP	100K	5%	1/8W	
R505	1-216-262-81	METAL CHIP	470K	5%	1/8W	
R506	1-216-226-81	METAL CHIP	15K	5%	1/8W	
R507	1-216-158-81	METAL CHIP	22	5%	1/8W	
R508	1-216-229-81	METAL CHIP	20K	5%	1/8W	
R509	1-216-216-81	METAL CHIP	5.6K	5%	1/8W	
R510	1-216-210-81	METAL CHIP	3.3K	5%	1/8W	
R511	1-216-208-81	METAL CHIP	2.7K	5%	1/8W	
R512	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R513	1-247-843-00	CARBON	3.3K	5%	1/6W	
R514	1-216-224-81	METAL CHIP	12K	5%	1/8W	
R515	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R516	1-216-174-81	METAL CHIP	100	5%	1/8W	
R517	1-216-184-81	METAL CHIP	270	5%	1/8W	
R518	1-216-192-81	METAL CHIP	560	5%	1/8W	
R519	1-216-250-81	METAL CHIP	150K	5%	1/8W	
R520	1-216-235-81	METAL CHIP	36K	5%	1/8W	
R521	1-216-198-81	METAL CHIP	1K	5%	1/8W	

Ref.No.	Part No.	Description				Remark
R522	1-216-166-81	METAL CHIP	47	5%	1/8W	
R601	1-216-234-81	METAL CHIP	33K	5%	1/8W	
R602	1-216-230-81	METAL CHIP	22K	5%	1/8W	
R603	1-216-218-81	METAL CHIP	6.8K	5%	1/8W	
R604	1-216-230-81	METAL CHIP	22K	5%	1/8W	
R605	1-216-214-81	METAL CHIP	4.7K	5%	1/8W	
R606	1-216-238-81	METAL CHIP	47K	5%	1/8W	
R607	1-216-210-81	METAL CHIP	3.3K	5%	1/8W	
R608	1-216-242-81	METAL CHIP	68K	5%	1/8W	
R609	1-216-237-81	METAL CHIP	43K	5%	1/8W	
R610	1-216-210-81	METAL CHIP	3.3K	5%	1/8W	
R611	1-216-226-81	METAL CHIP	15K	5%	1/8W	
R612	1-216-232-81	METAL CHIP	27K	5%	1/8W	
R613	1-216-228-81	METAL CHIP	18K	5%	1/8W	
R614	1-216-246-81	METAL CHIP	100K	5%	1/8W	
R615	1-216-216-81	METAL CHIP	5.6K	5%	1/8W	
R616	1-216-211-81	METAL CHIP	3.6K	5%	1/8W	
R617	1-216-277-81	METAL CHIP	2M	5%	1/8W	
R618	1-216-222-81	METAL CHIP	10K	5%	1/8W	
R619	1-216-210-81	METAL CHIP	3.3K	5%	1/8W	
R620	1-216-216-81	METAL CHIP	5.6K	5%	1/8W	
R621	1-216-206-81	METAL CHIP	2.2K	5%	1/8W	
R622	1-216-166-81	METAL CHIP	47	5%	1/8W	
R623	1-216-198-81	METAL CHIP	1K	5%	1/8W	
R624	1-216-218-81	METAL CHIP	6.8K	5%	1/8W	
R625	1-216-198-81	METAL CHIP	1K	5%	1/8W	

VARIABLE RESISTOR

Ref.No.	Part No.	Description				Remark
RV151	1-228-808-00	RES, VAR, SLIDE 200K				
RV152	1-228-589-00	RES, ADJ, METAL GLAZE 100K				
RV153	1-230-017-00	RES, ADJ, METAL GLAZE 470K				
RV154	1-228-589-00	RES, ADJ, METAL GLAZE 100K				
RV201	1-228-591-00	RES, ADJ, METAL GLAZE 10K				
RV202	1-226-763-00	RES, ADJ, METAL GLAZE 4.7K				
RV401	1-226-702-00	RES, ADJ, METAL GLAZE 2.2K				
RV402	1-226-704-00	RES, ADJ, METAL GLAZE 470K				
RV501	1-228-585-00	RES, ADJ, CARBON 5K				
RV502	1-226-772-00	RES, ADJ, METAL GLAZE 4.7K				
RV601	1-226-763-00	RES, ADJ, METAL GLAZE 4.7K				
RV602	1-228-592-00	RES, ADJ, METAL GLAZE 1K				
RV603	1-228-591-00	RES, ADJ, METAL GLAZE 10K				
RV604	1-228-592-00	RES, ADJ, METAL GLAZE 1K				

SWITCH

Ref.No.	Part No.	Description				Remark
S151	1-554-068-00	SWITCH, SLIDE				

THERMISTOR

Ref.No.	Part No.	Description				Remark
TH501	1-800-198-XX	THERMISTOR S-1K				

Ref.No.	Part No.	Description				Remark
	●:1-606-654-00	C BOARD *******				
	1-526-736-00	SOCKET, CRT				

CAPACITOR

Ref.No.	Part No.	Description				Remark
C431	1-102-038-00	CERAMIC	0.001MF		500V	

RESISTOR

Ref.No.	Part No.	Description				Remark
R431	1-247-053-00	CARBON	1M		1/8W	
R432	1-247-053-00	CARBON	1M		1/8W	
R433	1-246-784-00	CARBON	1.2K		1/8W	

VARIABLE RESISTOR

Ref.No.	Part No.	Description				Remark
RV431	1-228-573-00	RES, ADJ, CARBON 2M				
RV432	1-228-573-00	RES, ADJ, CARBON 2M				

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Ref.No.	Part No.	Description				Remark
	●:A-1345-407-A	D1 BOARD, COMPLETE ******************				
	4-026-902-00	SPACER (B), JACK				
	●:4-026-935-00	CASE (MAIN), SHIELD				
	●:4-026-936-00	LID, SHIELD CASE				
	●:4-027-419-00	HEAT SINK, TRANSFORMER				

CAPACITOR

Ref.No.	Part No.	Description				Remark
C652	1-123-995-00	ELECT	100MF	20%	16V	
C653	1-131-368-00	TANTALUM	3.3MF	20%	10V	
C654	1-123-612-00	ELECT	2.2MF	20%	50V	
C655	1-124-025-00	ELECT	100MF	20%	16V	
C656	1-163-059-91	CERAMIC CHIP	0.01MF	10%	50V	
C658	1-163-059-91	CERAMIC CHIP	0.01MF	10%	50V	
C659	1-163-205-91	CERAMIC CHIP	0.001MF	5%	50V	
C660	1-163-055-91	CERAMIC CHIP	0.0047MF	10%	50V	
C661	1-163-059-91	CERAMIC CHIP	0.01MF	10%	50V	
C662	1-163-059-91	CERAMIC CHIP	0.01MF	10%	50V	
C663	1-163-059-91	CERAMIC CHIP	0.01MF	10%	50V	
C801	1-123-617-00	ELECT	10MF	20%	16V	
C802	1-106-369-00	MYLAR	0.012MF	5%	200V	
C803	1-123-617-00	ELECT	10MF	20%	16V	
C804	1-108-685-11	MYLAR	0.0027MF	10%	200V	
C805	1-163-291-91	CERAMIC CHIP	15PF	5%	50V	
C806	1-131-387-00	TANTALUM	47MF	20%	6.3V	
C807	1-131-408-00	TANTALUM	1MF	20%	25V	
C808	1-101-001-00	CERAMIC	0.001MF		50V	
C830	1-131-365-00	TANTALUM	10MF	20%	20V	
C831	1-163-078-91	CERAMIC CHIP	0.033MF	10%	25V	
C832	1-123-612-00	ELECT	2.2MF	20%	50V	
C833	1-123-816-00	ELECT	10MF	20%	50V	
C834	1-135-005-00	TANTAL. CHIP	0.22MF	20%	20V	

DIODE

Ref.No.	Part No.	Description	Remark
D653	8-719-815-85	DIODE 1S1585	
D654	8-719-981-01	DIODE ERA81-004	
D701	8-719-101-23	DIODE 1SS123	
D702	8-719-100-05	DIODE 1S2837	
D801	8-719-100-03	DIODE 1S2835	
D802	8-719-901-93	DIODE V19E	
D803A,B	8-719-100-03	DIODE 1S2835	
D804	8-719-900-93	DIODE V09C	
D805	8-719-100-03	DIODE 1S2835	
D806	8-719-101-23	DIODE 1SS123	
D807	8-719-101-23	DIODE 1SS123	

JACK

Ref.No.	Part No.	Description	Remark
J601	1-507-563-21	JACK, DC	

COIL

Ref.No.	Part No.	Description	Remark
L820	1-407-171-XX	MICRO INDUCTOR 150UH	
L821	1-407-205-XX	MICRO INDUCTOR 8.2MMH	

TRANSISTOR

Ref.No.	Part No.	Description	Remark
Q654	8-729-271-23	TRANSISTOR 2SC2712	
Q655	8-729-378-84	TRANSISTOR 2SD788	
Q701	8-729-101-59	TRANSISTOR 2SD1285	
Q702	8-729-101-59	TRANSISTOR 2SD1285	
Q703	8-729-101-58	TRANSISTOR 2SB961	
Q801	8-729-271-23	TRANSISTOR 2SC2712	
Q802	8-729-195-82	TRANSISTOR 2SC2958	
Q803	8-729-271-23	TRANSISTOR 2SC2712	
Q804	8-729-195-82	TRANSISTOR 2SC2958	
Q805	8-729-271-23	TRANSISTOR 2SC2712	
Q821	8-729-199-92	TRANSISTOR 2SD999	
Q822	8-729-101-07	TRANSISTOR 2SB798	

RESISTOR

Ref.No.	Part No.	Description	Remark
R651	1-216-230-91	METAL CHIP 22K 5% 1/8W	
R657	1-216-190-91	METAL CHIP 470 5% 1/8W	
R701	1-216-270-91	METAL CHIP 1M 5% 1/8W	
R702	1-216-206-91	METAL CHIP 2.2K 5% 1/8W	
R703	1-216-206-91	METAL CHIP 2.2K 5% 1/8W	
R704	1-216-206-91	METAL CHIP 2.2K 5% 1/8W	
R705	1-216-270-91	METAL CHIP 1M 5% 1/8W	
R801	1-216-230-91	METAL CHIP 22K 5% 1/8W	
R802	1-216-198-91	METAL CHIP 1K 5% 1/8W	
R803	1-216-230-91	METAL CHIP 22K 5% 1/8W	
R804	1-216-198-91	METAL CHIP 1K 5% 1/8W	
R805	1-216-240-91	METAL CHIP 56K 5% 1/8W	
R806	1-216-226-91	METAL CHIP 15K 5% 1/8W	
R807	1-216-258-91	METAL CHIP 330K 5% 1/8W	
R809	1-216-236-91	METAL CHIP 39K 5% 1/8W	
R810	1-216-240-91	METAL CHIP 56K 5% 1/8W	
R831	1-216-270-91	METAL CHIP 1M 5% 1/8W	
R832	1-216-150-91	METAL CHIP 10 5% 1/8W	
R833	1-216-150-91	METAL CHIP 10 5% 1/8W	
R834	1-216-234-91	METAL CHIP 33K 5% 1/8W	
R835	1-216-270-91	METAL CHIP 1M 5% 1/8W	

TRANSFORMER

Ref.No.	Part No.	Description	Remark
T651	1-421-521-00	TRANSFORMER, FERRITE	

* * *

●:A-1345-410-A D2 BOARD, COMPLETE

CAPACITOR

Ref.No.	Part No.	Description	Remark
C851	1-123-661-00	ELECT 100MF 20% 6.3V	
C852	1-135-004-00	TANTAL. CHIP 1MF 20% 20V	
C853	1-135-002-00	TANTAL. CHIP 10MF 20% 6.3V	
C854	1-135-004-00	TANTAL. CHIP 1MF 20% 20V	
C855	1-163-059-91	CERAMIC CHIP 0.01MF 10% 50V	
C856	1-135-004-00	TANTAL. CHIP 1MF 20% 20V	
C857	1-135-003-00	TANTAL. CHIP 2.2MF 20% 10V	
C858	1-135-001-00	TANTAL. CHIP 3.3MF 20% 6.3V	
C859	1-163-059-91	CERAMIC CHIP 0.01MF 10% 50V	
C860	1-163-059-91	CERAMIC CHIP 0.01MF 10% 50V	
C861	1-163-181-91	CERAMIC CHIP 100PF 5% 50V	
C862	1-163-181-91	CERAMIC CHIP 100PF 5% 50V	
C863	1-163-205-91	CERAMIC CHIP 0.001MF 5% 50V	
C864	1-163-205-91	CERAMIC CHIP 0.001MF 5% 50V	
C865	1-163-017-00	CERAMIC CHIP 0.0047MF 10% 50V	
C871	1-131-383-00	TANTALUM 10MF 20% 6.3V	
C872	1-163-205-91	CERAMIC CHIP 0.001MF 5% 50V	
C873	1-161-009-00	CERAMIC 0.0047MF 10% 25V	
C874	1-163-063-91	CERAMIC CHIP 0.022MF 10% 50V	
C875	1-163-321-91	CERAMIC CHIP 270PF 5% 50V	
C877	1-123-661-00	ELECT 100MF 20% 6.3V	
C878	1-163-021-00	CERAMIC CHIP 0.01MF 10% 50V	
C879	1-163-321-91	CERAMIC CHIP 270PF 5% 50V	

IC

Ref.No.	Part No.	Description	Remark
IC871	8-759-600-25	IC CX22010	

TRANSISTOR

Ref.No.	Part No.	Description	Remark
Q851	8-729-271-23	TRANSISTOR 2SC2712	
Q852	8-729-216-22	TRANSISTOR 2SA1162	

RESISTOR

Ref.No.	Part No.	Description	Remark
R851	1-216-250-81	METAL CHIP 150K 5% 1/8W	
R852	1-216-250-81	METAL CHIP 150K 5% 1/8W	
R853	1-216-232-81	METAL CHIP 27K 5% 1/8W	
R854	1-216-224-81	METAL CHIP 12K 5% 1/8W	
R855	1-216-198-81	METAL CHIP 1K 5% 1/8W	
R856	1-216-204-81	METAL CHIP 1.8K 5% 1/8W	
R857	1-216-213-81	METAL CHIP 4.3K 5% 1/8W	
R871	1-216-232-81	METAL CHIP 27K 5% 1/8W	
R872	1-216-220-81	METAL CHIP 8.2K 5% 1/8W	
R873	1-216-216-81	METAL CHIP 5.6K 5% 1/8W	
R874	1-216-198-81	METAL CHIP 1K 5% 1/8W	
R875	1-216-230-81	METAL CHIP 22K 5% 1/8W	
R876	1-216-236-81	METAL CHIP 39K 5% 1/8W	
R877	1-216-222-81	METAL CHIP 10K 5% 1/8W	
R878	1-216-250-81	METAL CHIP 150K 5% 1/8W	
R880	1-216-228-81	METAL CHIP 18K 5% 1/8W	
R881	1-216-206-81	METAL CHIP 2.2K 5% 1/8W	
R882	1-216-166-81	METAL CHIP 47 5% 1/8W	
R883	1-216-230-81	METAL CHIP 22K 5% 1/8W	
R884	1-216-230-81	METAL CHIP 22K 5% 1/8W	
R885	1-216-232-81	METAL CHIP 27K 5% 1/8W	
R886	1-216-230-81	METAL CHIP 22K 5% 1/8W	

VARIABLE RESISTOR

Ref.No.	Part No.	Description	Remark
RV851	1-228-587-00	RES, ADJ, METAL GLAZE 22K	
RV852	1-228-587-00	RES, ADJ, METAL GLAZE 22K	
RV853	1-228-588-00	RES, ADJ, METAL GLAZE 4.7K	
RV855	1-228-590-00	RES, ADJ, METAL GLAZE 22K	
RV856	1-228-590-00	RES, ADJ, METAL GLAZE 22K	
RV857	1-228-590-00	RES, ADJ, METAL GLAZE 22K	
RV872	1-228-587-00	RES, ADJ, METAL GLAZE 22K	
RV873	1-228-593-00	RES, ADJ, METAL GLAZE 2.2K	

THERMISTOR

Ref.No.	Part No.	Description	Remark
TH851	1-800-198-XX	THERMISTOR S-1K	
TH852	1-800-198-XX	THERMISTOR S-1K	

* * *

●:1-606-656-00 H BOARD

VARIABLE RESISTOR

Ref.No.	Part No.	Description	Remark
RV901	1-228-572-00	RES, VAR, CARBON 10K	

SWITCH

Ref.No.	Part No.	Description	Remark
S901	1-554-068-00	SWITCH, SLIDE	

* * *

●:1-606-655-00 EJ BOARD

CAPACITOR

Ref.No.	Part No.	Description	Remark
C901	1-131-408-00	TANTALUM 1MF 20% 25V	

JACK

Ref.No.	Part No.	Description	Remark
J901	1-507-688-00	JACK (STEREO PLUG)	

RESISTOR

Ref.No.	Part No.	Description	Remark
R901	1-247-783-00	CARBON 10 5% 1/6W	
R902	1-247-783-00	CARBON 10 5% 1/6W	
R903	1-247-797-00	CARBON 39 5% 1/6W	

* * *

●:1-606-650-00 S BOARD

* * *

MISCELLANEOUS

Ref.No.	Part No.	Description	Remark
	⚠.1-439-291-00	TRANSFORMER ASSY, FLYBACK	
	1-452-265-00	MAGNET ASSY, CENTERING	
	⚠.1-463-450-00	TUNER, ET (BT-835)	
	1-501-199-21	ANTENNA, TELESCOPIC	
L901	⚠.1-451-213-00	DEFLECTION YOKE	
SP901	1-503-120-00	SPEAKER (023F006)	
V901	⚠.8-733-651-05	CRT ED-15(02PM)	

* * *

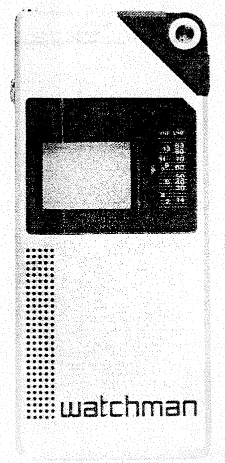
ACCESSORIES AND PACKING MATERIALS

Part No.	Description	Remark
⚠.1-463-451-00	ADAPTOR, AC (AC-129UB)(UK Model)	
⚠.1-463-452-00	ADAPTOR, AC (AC-129E)(AEP Model)	
4-026-955-11	CASE, CARRYING	
4-027-410-00	CUSHION	
4-027-423-00	SPACER	
4-027-424-00	INDIVIDUAL CARTON (ASSY)	
4-027-428-00	CARTON, ACCESSORY	
4-493-657-11	MANUAL, INSTRUCTION	
8-951-166-90	MDR-E2 SET	

The components identified by shading and mark ⚠ are critical for safety. Replace only with part number specified.

FD-210BE

ADJUSTMENT MANUAL



watchman

CIRCUIT ADJUSTMENT

1. NOTE

(1) TEST EQUIPMENT REQUIRED
   1. Oscilloscope
   2. Digital voltmeter
   3. Color bar/pattern generator
   4. Frequency counter
   5. Regulated dc power supply

(2) INPUT SIGNAL
a cross-hatch, a color-bar or an off-air signal

(3) These adjustment should be performed with 6 V dc unless otherwise noted.

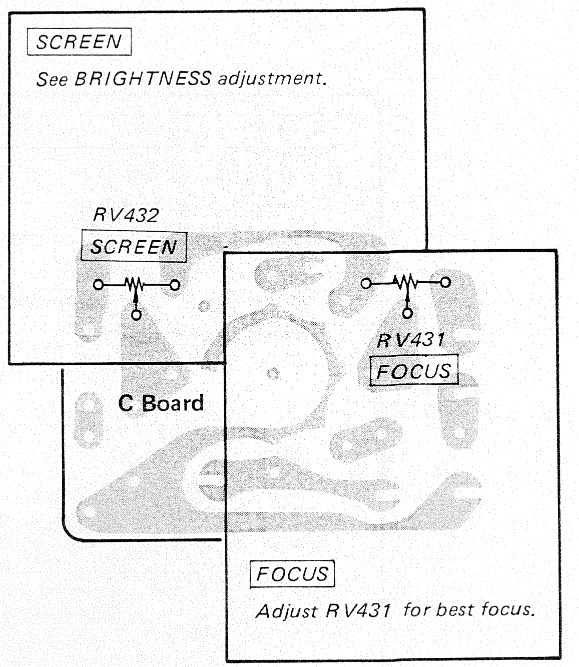
(4) ADJUSTMENT

Adjustment	Circuit Board
SCREEN FOCUS	C Board
Channel Indication Circuit RF AGC IF AGC H. Frequency V. Hold Cut Off Duty MAX 4.5 V Adj 14.5 V Adj Brightness Contrast	A Board
H. Alignment Barrel Correction V. Linearity H. Size V. Size Curve Mag Adjustment Curve Distortion Key Stone Correction	D2 Board

2. C BOARD ADJUSTMENT

SCREEN

See BRIGHTNESS adjustment.



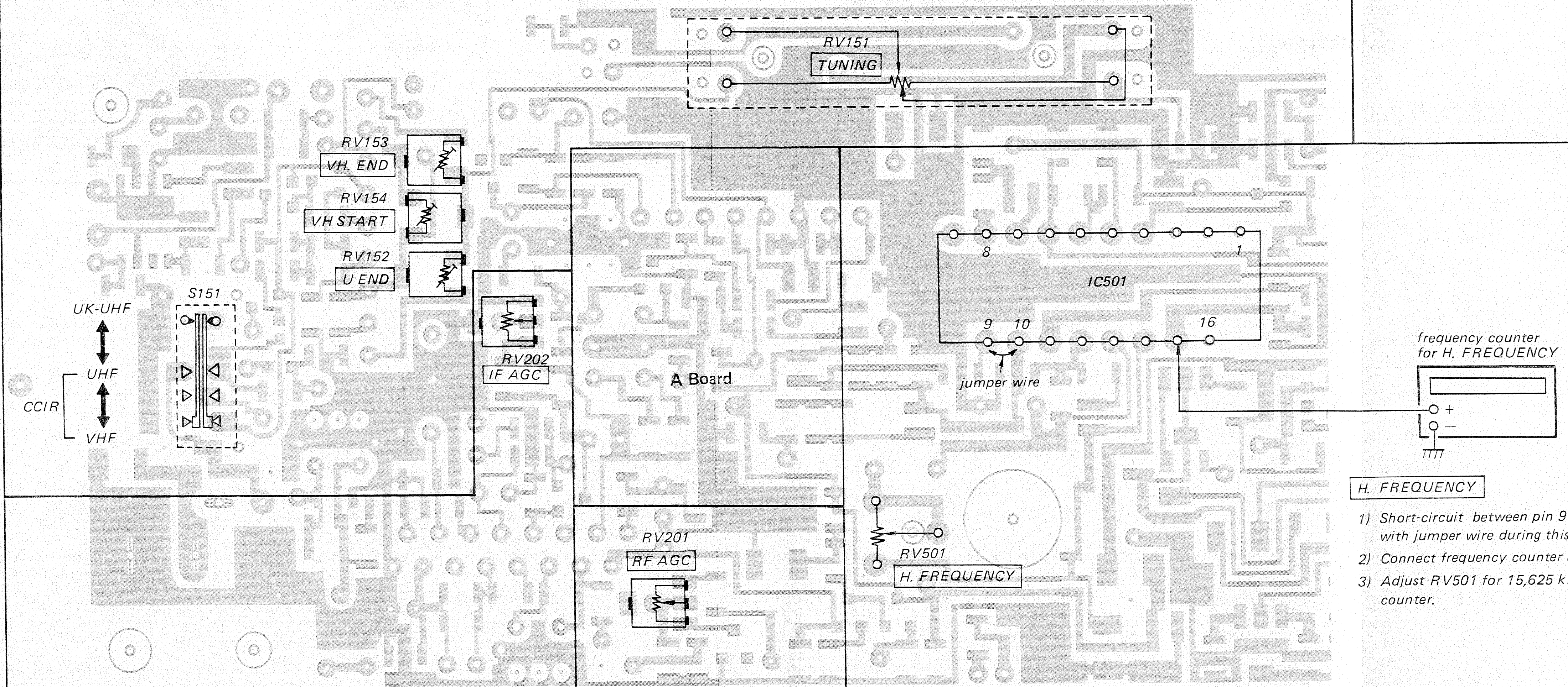
FOCUS

Adjust RV431 for best focus.

3. A BOARD ADJUSTMENT

CHANNEL INDICATION CIRCUIT

1) Set Band Select Switch to UHF (UK).
2) Set pointer at channel 68.
3) Adjust RV152 to receive channel 68.
4) Set pointer at channel 21.
5) Adjust RV152 to receive channel 21.
6) Repeat steps 1) – 5).
7) Set Band Select Switch to VHF.
8) Set pointer at channel 12.
9) Adjust RV153 to receive channel 12.
10) Set pointer at channel 5.
11) Adjust RV154 to receive channel 5.
12) Repeat steps 8) – 11).


RV151
TUNING
RV153
VH. END
RV154
VH START
RV152
U END
S151
UK-UHF
UHF
CCIR
VHF
RV202
IF AGC
A Board
8
1
IC501
9
10
16
jumper wire
frequency counter
for H. FREQUENCY
+
–
RV201
RF AGC
RV501
H. FREQUENCY

IF AGC

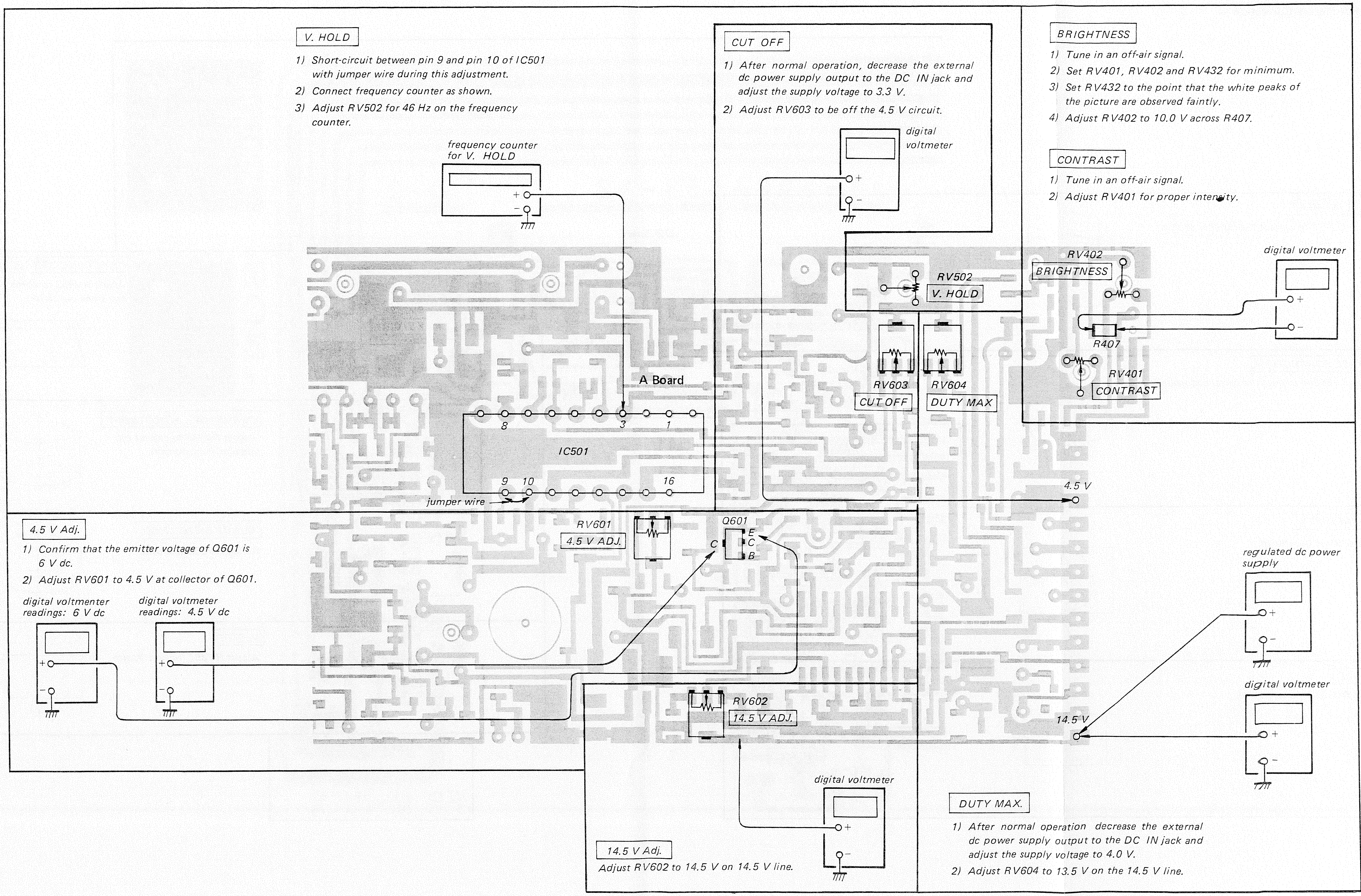
1) Tune in an off-air signal.
2) Adjust RV202 for stable and proper intensity picture.

RF AGC

1) Tune in an off-air signal.
2) Adjust RV201 so that snow noise disappear from the picture.

H. FREQUENCY

1) Short-circuit between pin 9 and pin 10 of IC501 with jumper wire during this adjustment.
2) Connect frequency counter as shown.
3) Adjust RV501 for 15,625 kHz on the frequency counter.



frequency counter for V. HOLD
+
−
A Board
8
3
1
IC501
9
10
16
jumper wire
RV502
V. HOLD
RV603
CUT OFF
RV604
DUTY MAX
digital voltmeter
RV402
BRIGHTNESS
R407
RV401
CONTRAST
4.5 V
RV601
4.5 V ADJ.
Q601
E
C
B
C
digital voltmenter readings: 6 V dc
digital voltmeter readings: 4.5 V dc
RV602
14.5 V ADJ.
regulated dc power supply
14.5 V

V. HOLD

1) Short-circuit between pin 9 and pin 10 of IC501 with jumper wire during this adjustment.
2) Connect frequency counter as shown.
3) Adjust RV502 for 46 Hz on the frequency counter.

CUT OFF

1) After normal operation, decrease the external dc power supply output to the DC IN jack and adjust the supply voltage to 3.3 V.
2) Adjust RV603 to be off the 4.5 V circuit.

BRIGHTNESS

1) Tune in an off-air signal.
2) Set RV401, RV402 and RV432 for minimum.
3) Set RV432 to the point that the white peaks of the picture are observed faintly.
4) Adjust RV402 to 10.0 V across R407.

CONTRAST

1) Tune in an off-air signal.
2) Adjust RV401 for proper intensity.

4.5 V Adj.

1) Confirm that the emitter voltage of Q601 is 6 V dc.
2) Adjust RV601 to 4.5 V at collector of Q601.

14.5 V Adj.

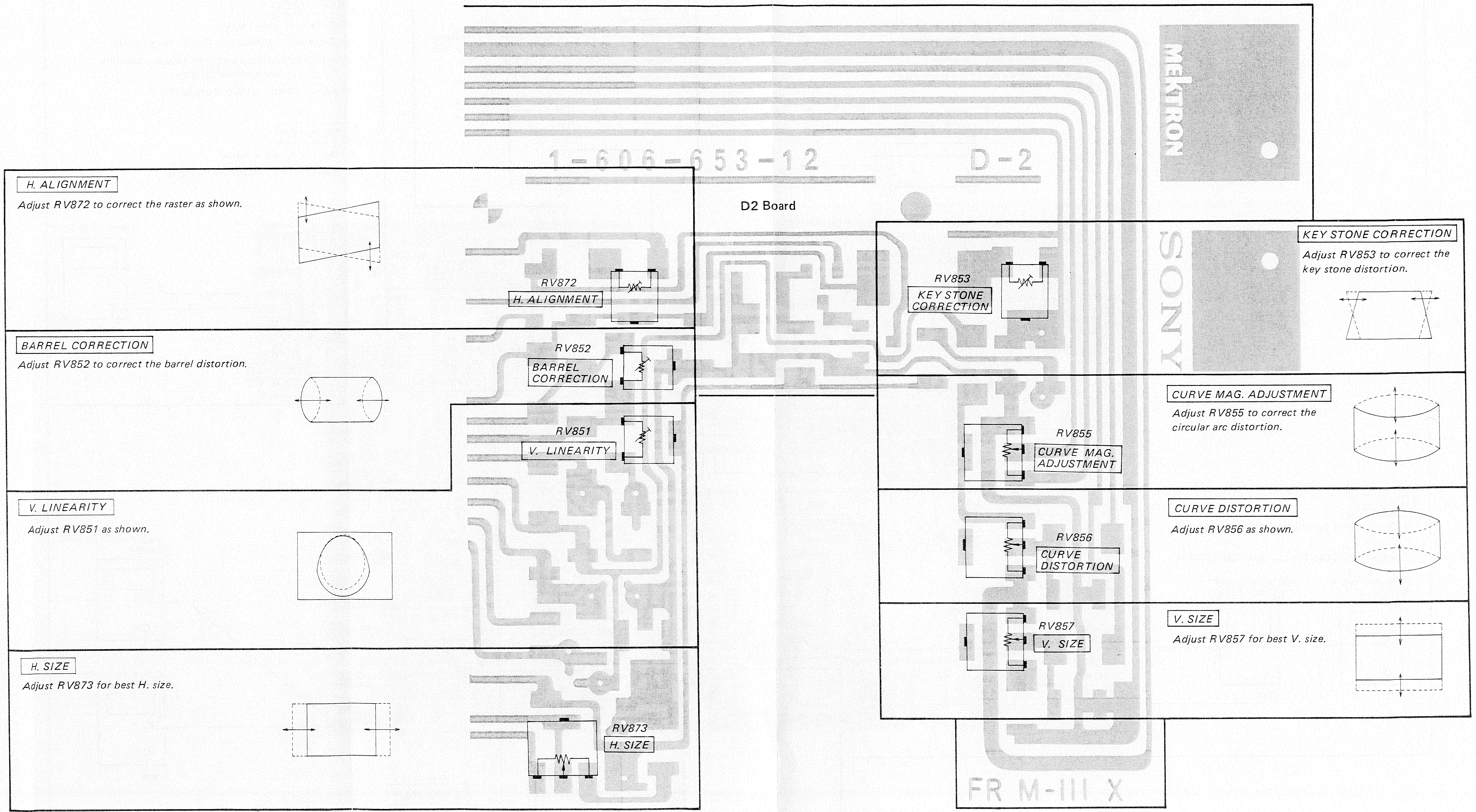
Adjust RV602 to 14.5 V on 14.5 V line.

DUTY MAX.

1) After normal operation decrease the external dc power supply output to the DC IN jack and adjust the supply voltage to 4.0 V.
2) Adjust RV604 to 13.5 V on the 14.5 V line.

4. D2 BOARD ADJUSTMENT

— For Picture Correction —



D2 Board

H. ALIGNMENT

Adjust RV872 to correct the raster as shown.

BARREL CORRECTION

Adjust RV852 to correct the barrel distortion.

V. LINEARITY

Adjust RV851 as shown.

H. SIZE

Adjust RV873 for best H. size.

KEY STONE CORRECTION

Adjust RV853 to correct the key stone distortion.

CURVE MAG. ADJUSTMENT

Adjust RV855 to correct the circular arc distortion.

CURVE DISTORTION

Adjust RV856 as shown.

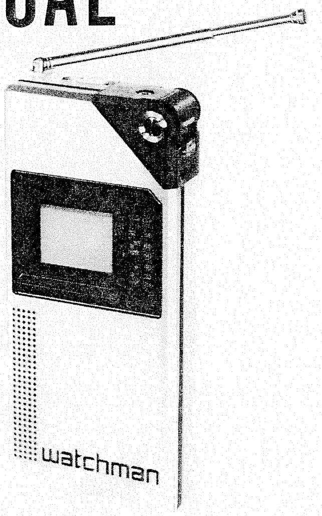
V. SIZE

Adjust RV857 for best V. size.

1-606-653-12
D-2
MEKTRON
SONY
FR M-III X
RV872
H. ALIGNMENT
RV852
BARREL CORRECTION
RV851
V. LINEARITY
RV873
H. SIZE
RV853
KEY STONE CORRECTION
RV855
CURVE MAG. ADJUSTMENT
RV856
CURVE DISTORTION
RV857
V. SIZE

FD-210BE

OPERATION MANUAL



1. SUMMARY

1-1. MAIN FEATURES OF FD-210BE

16.5 Millimeters Ultra-slim Flat CRT "FD Tube"

The ultra-thinness of this model is achieved by use of the "FD tube". Also, because the electron beam hits the fluorescent surface directly, a bright picture is obtained.

Various Small Parts and IC Utilization in the Main Circuits, Chip Mounting

The palm-of-the-hand size 33 millimeter slim-type is achieved through use of ultra-small flyback transformer, ultra-slim deflection yokes, ultra-small one-pack tuner, switching regulator IC, signal processing IC and so on.

1.8W Low Power Consumption Design

Low power consumption of 1.8W, top class for a small B/W television, has been achieved. Also, the TV sound switch allows TV sound only, with no picture, when desired. (With AM3 battery: more than 2.5 hours of continuous normal use; more than 12 continuous hours with TV sound only.)

Ear Receiver Supplied for Enjoyment of Powerful Sound

An ear receiver (MDR-E2) is supplied for enjoyment of TV sound as powerful as that from hi-fi headphones, making it very appropriate for personal use. Also, headphones with a stereo mini-plug can be connected to this set's headphone jack.

4 Power Supply Systems Allow Use of Any Power Supply

All types of power supply can be used for this TV by using the AC adaptor (AC-129E, UB supplied), or car battery (separately sold car battery cord DCC-120), etc. Also, by using with the separately sold battery case BP-25 with AM2 batteries, 8.5 continuous hours of TV enjoyment are possible. (39 hours for TV sound only.)

Other Features

- External antenna terminal allowing use of car antenna.
- Equipped with UHF/VHF telescopic antenna.

1-2. SLIM-TYPE FLAT CRT - FD TUBE

This FD tube (FLAT DISPLAY tube) is an extremely thin 16.5 millimeters, to enable the flat structure of the TV. The flat TV FD-210BE has not only greatly changed the shape of television, but also allows easy pick-up of the TV information which contemporary people cannot be without, in the palm of the had, or in a pocket.

This "FD tube" employs a unique deflection method which performs 3-dimensional electron beam deflection, for depth as well as horizontal and vertical. In this flat display, the fluorescent surface and electron gun are positioned parallel, and the "flat structure" similar to a padddle shape is employed to achieve a CRT only 16.5 millimeters thick.

Therefore, the TV thickness is only 33 millimeters, so that it can easily be carried in an attaché case or handbag, and held in the palm of the hand for TV enjoument anytime and anywhere.

<Main Parts which Aid in Large-Scale Miniaturization>

The high voltage circuit flyback transformer and tuner which took up a lot of space in conventional TVs have been made much smaller. Besides these, the thin CRT deflection yoke, utilization of IC in the low power consumption power supply circuit (switching regulator), and wide use of chip components have alllowed the realization of the small-size slim FD-210BE.

- The TV sound switch turns off the picture and saves the battery, giving TV sound only. (12 hours of use with AM3 battery.)
- Electronic tuning type tuner for smooth continuous channel selection of VHF or UHF.
- External power supply input pin for use with home power supply or car battery.
- The 2-type flat CRT employs flat structure for 16.5 millimeter slimness and gives excellent picture start, and a bright picture with high resolution.

On conventional CRTs, the electron beam hits the fluorescent surface almost straight from the electron gun by horizontal deflection, as the electron gun and fluorescent surface cross at right angles. However, on the "FD tube", the electron gun which emits the electron beam and the fluorescent surface are positioned parallel. The electron beam is first deflected at the deflection plate, then is deflected again so that it turns almost at a right angle between the fluorescent surface and transparent electrode, and then hits the fluorescent surface in order to produce an image.

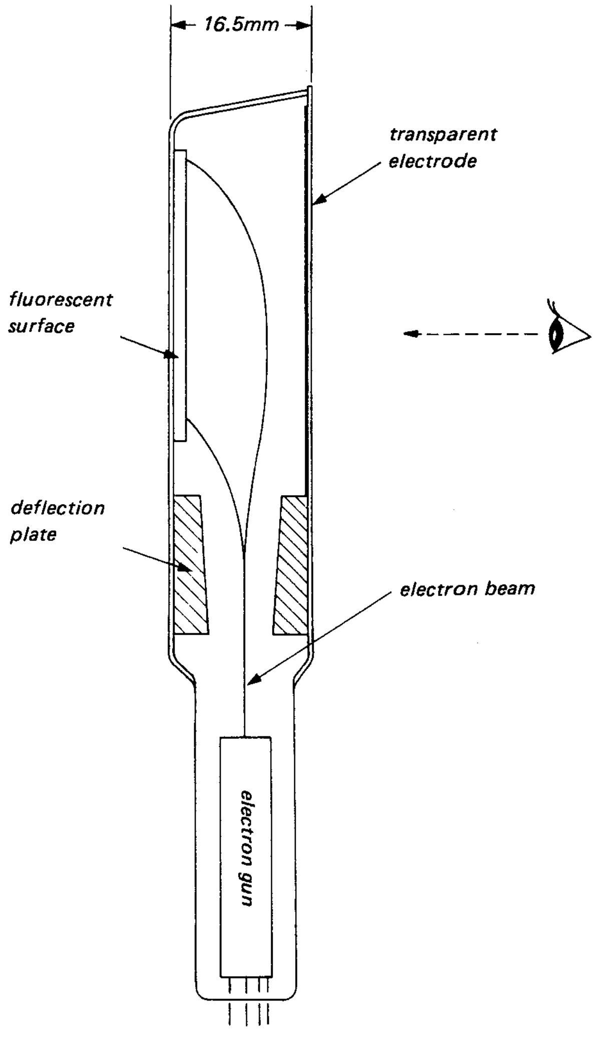


Fig. 1-1.

Therefore, the electron beam lands on the fluorescent surface at the bottom of the funnel as a parabolic type shape. (See Fig. 3) In this deflection system, the electrostatic method is used for vertical deflection and the electromagnetic method for horizontal deflection. In this way the deflection yokes are made thinner and the entire system can be made thinner. Also, ferrite is utilized in the electrostatic deflection plate in order to obtain reduced power consumption by decreasing deflection power. In order to obtain proper focus, a one-sided deflection system is employed. A uniform picture quality has been successfully achieved, because the deflection plate on the panel side is connected to the transparent electrode and the other deflection plate is connected to the electron gun high voltage electrode, so the electron lens thickness is changed automatically, giving natural vertical direction focus (automatic focus).

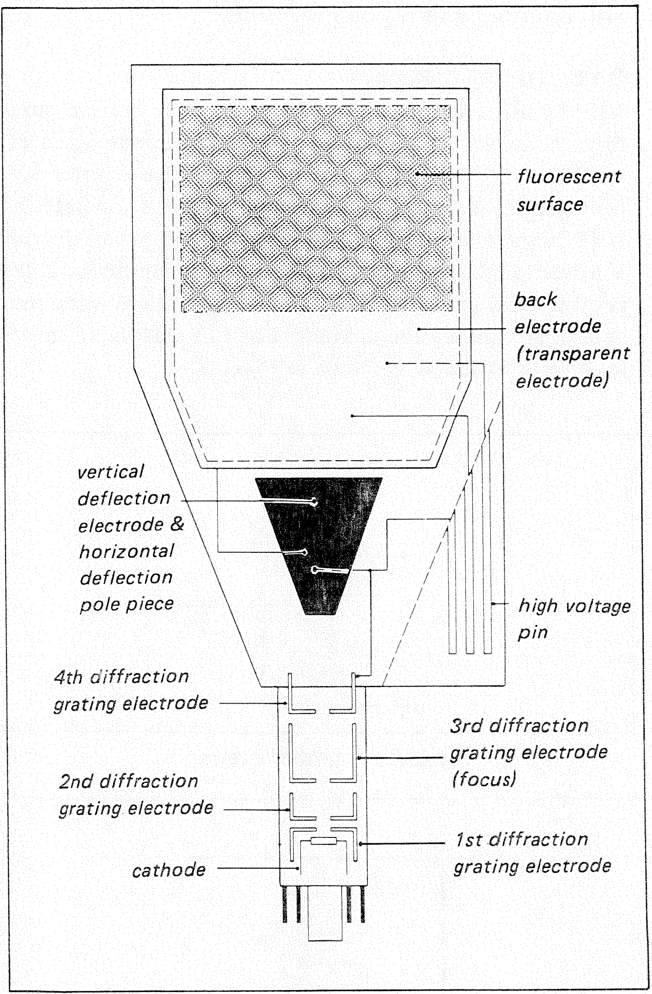

fluorescent surface
back electrode (transparent electrode)
vertical deflection electrode & horizontal deflection pole piece
high voltage pin
4th diffraction grating electrode
3rd diffraction grating electrode (focus)
2nd diffraction grating electrode
1st diffraction grating electrode
cathode

Fig. 1-2.

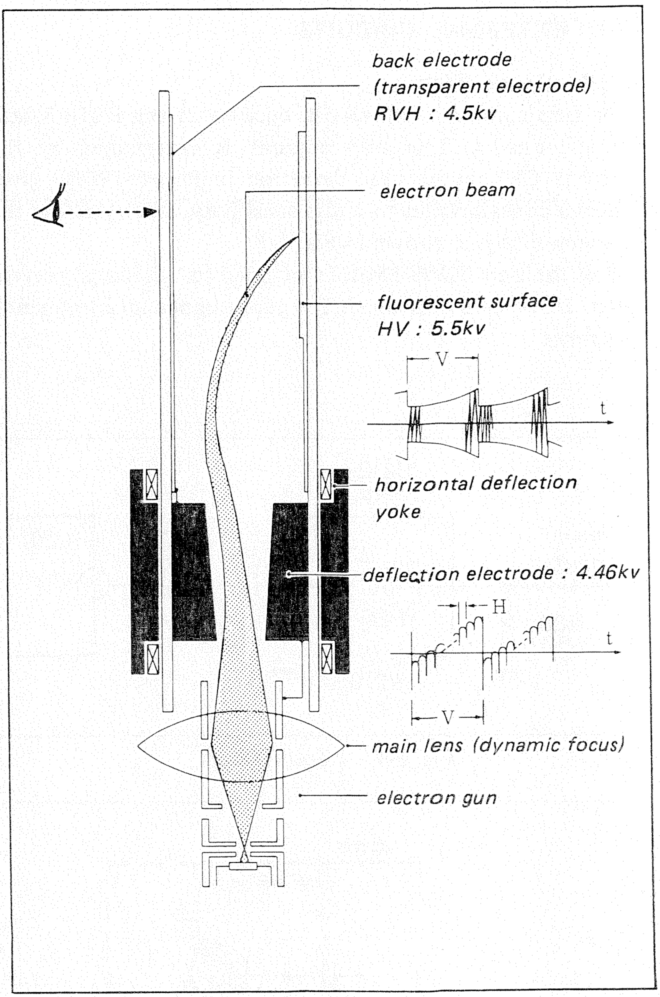

back electrode (transparent electrode) RVH : 4.5kv
electron beam
fluorescent surface HV : 5.5kv
V
t
horizontal deflection yoke
deflection electrode : 4.46kv
H
t
V
main lens (dynamic focus)
electron gun

Fig. 1-3.

1-3. "FD tube" Main Specifications

Size: 16.5 (thickness) x 133 (depth) x 55 (width) mm

Effective screen size: 30 (height) x 40 (width) mm 2-type

Luminance: more than 35f lux

Resolution: more than 250 lines

System: horizontal: electromagnetic deflection (maximum deflection angle 58°)

vertical: electrostatic deflection

2. CIRCUIT OPERATION DESCRIPTION

FD-210BE is a slim, portable B/W TV, and therefore uses double-sided boards, and also uses many chip components and small parts. The tuner is the BT-835, VHF/UHF 1 pack tuner, developed especially for FD-210BE.

2-1. EXTERNAL CIRCUITS

2-1-1. Sound Trap

The trap amount is P/S=8 dB, because of the R210 3.0kΩ dump resistor. This trap amount is determined by the present CRT audio beat detection limit. FD-210BE gives serious consideration to audio sensitivity, and therefore the trap amount is as shown in Fig. 1-1.

After the trap, R208 150Ω is included for discharge prevention. L204 is to improve IC201 input impedance frequency response.

2-1-2. Video Inverter

VIF video buffer output from IC201 pin ⑯ is emitter-follower output, as shown in Fig. 1-2, and there is also collector side output at pin ⑭.

Therefore, it is possible to obtain video inverted output from pin ⑭, but at Vcc=4.5V, only VCE=0.1V can be obtained as pin ⑯ and pin ⑭ non-signal voltage. So, pin ⑯ is further inverted on FD-210BE.

2-1-3. RF AGC Buffer

VIF IC RF AGC output IC201 pin ④ is current supply drive as shown in Fig. 1-3. When the tuner side operates as a VHF tuner, the UHF side RF amp base emitter space becomes IC load, as a simple diode. When it operates as a UHF tuner, the opposite occurs. Therefore, when the tuner is driven directly from IC pin④, the load is about 2.2kΩ, and the AGC amp gain is not enough, and there is too much additional attenuation amount. For this reason, an emitter-follower is included as shown in Fig. 1-3.

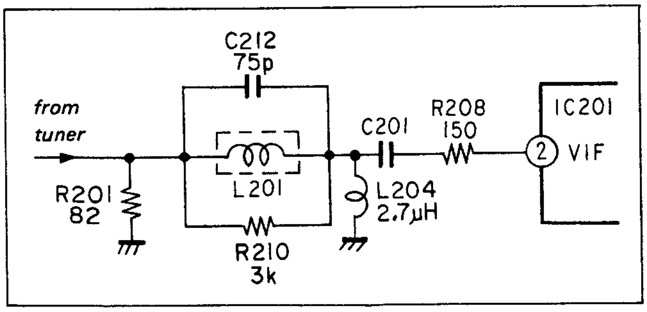

C212
75p
from
tuner
R201
82
L201
R210
3k
C201
R208
150
L204
2.7μH
IC201
2
VIF

Fig. 2-1. Sound Trap

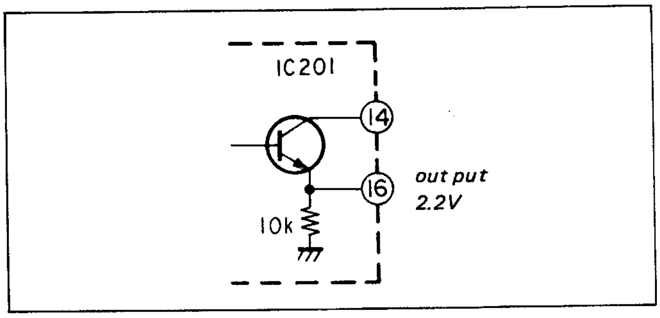

IC201
14
16
10k
output
2.2V

Fig. 2-2. Video Inverter

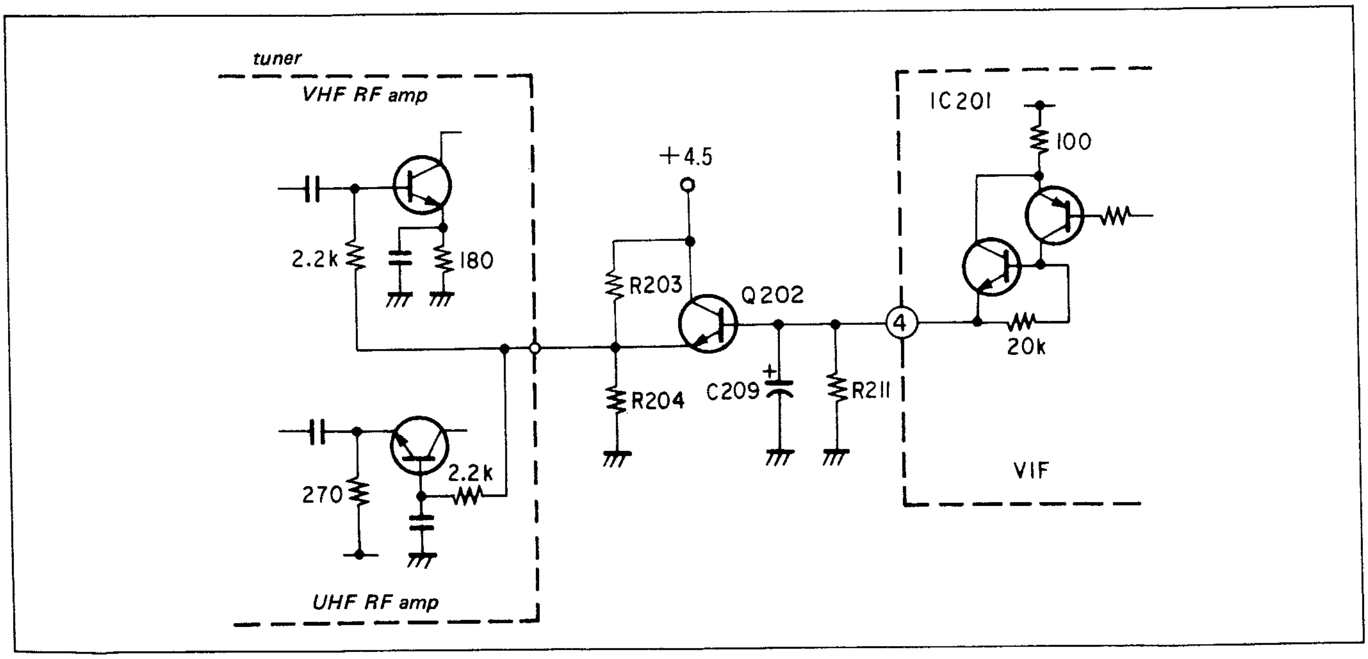

tuner
VHF RF amp
2.2k
180
270
2.2k
UHF RF amp
+4.5
R203
Q202
R204
C209
R211
4
IC201
100
20k
VIF

Fig. 2-3. RF AGC Buffer

2-1-4. SIF Switching Circuit

SIF IC251 M51378L peripheral circuits are shown in Fig. 1-4. CCIR (5.5 MHz) and UK (6 MHz) switching is performed by D251 A, B diode switch. For CCIR it is on the CF251 side, and on CF252 side for UK.

Simultaneously, L252 external capacitor C252 switching is performed by D252, and SIF tuning frequency is changed.

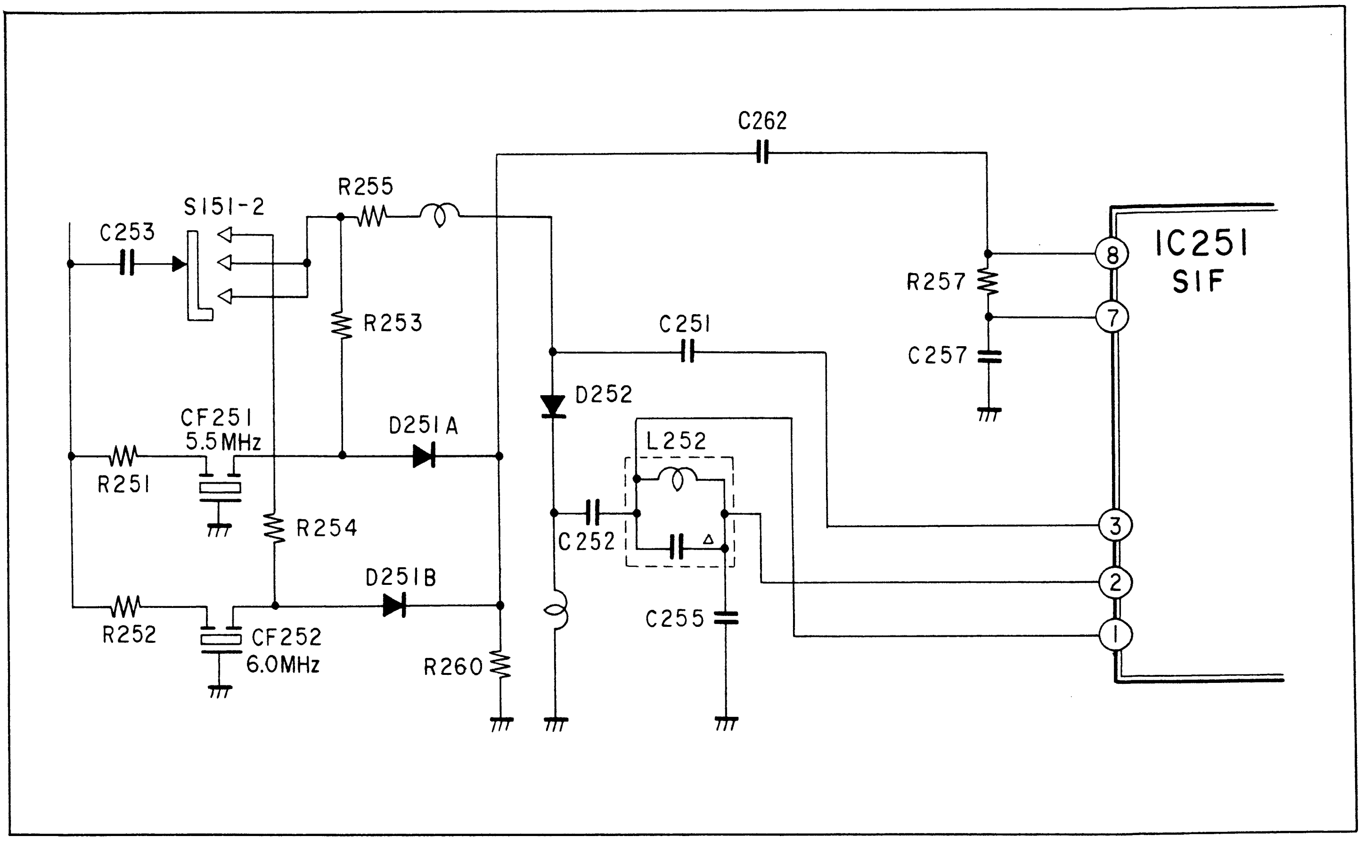

C262
R255
S151-2
C253
IC251
SIF
R257
R253
C251
C257
D252
CF251
5.5MHz
D251A
L252
R251
R254
C252
D251B
C255
R252
CF252
6.0MHz
R260
8
7
3
2
1

Fig. 2-4.

2-2. IC201 (M51364L) INTERNAL CIRCUITRY

The IF amp is a single 3-stage cascode amp. Gain control is performed by the two stages on the input side and is reverse AGC. The IF amp third stage output is simple L, C load, at pin ⑦, and gets more gain than resistor load. Also, for resistor load, sync section oscillation appears because of the board pattern, as shown in Fig. 2-1. However, for L, C load, this oscillation stops completely regardless of the pattern. IC201 pin ⑨ input signal performs image detction. This image detector circuit is a double balance multiplier.

The detection coil is a 5A coil. This coil's nonloaded Q is about 51, relatively low when compared to 10k.
Because this is a small portable TV, the IF filter takes use inside trains, etc. into consideration, and is strong with regard to flutter. and the time constant is as fast as possible for sag improvement.
IC201 RF AGC DELAY is forward AGC. Pin ⑤ 10kΩ variable resistor is for RF AGC setting, but the diode underneath it is for temperature compensation. The voltage is obtained via 150kΩ from the 35V tuner and is for reduced voltage response improvement. Fig. 2-2 is the block diagram of IC201.

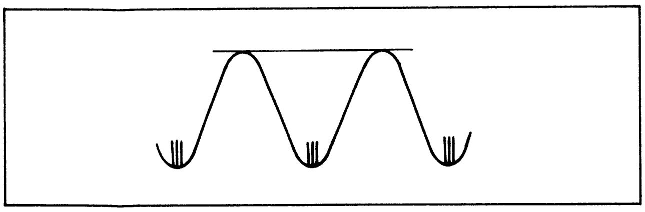


Fig. 2-5. Sync Section Oscillation

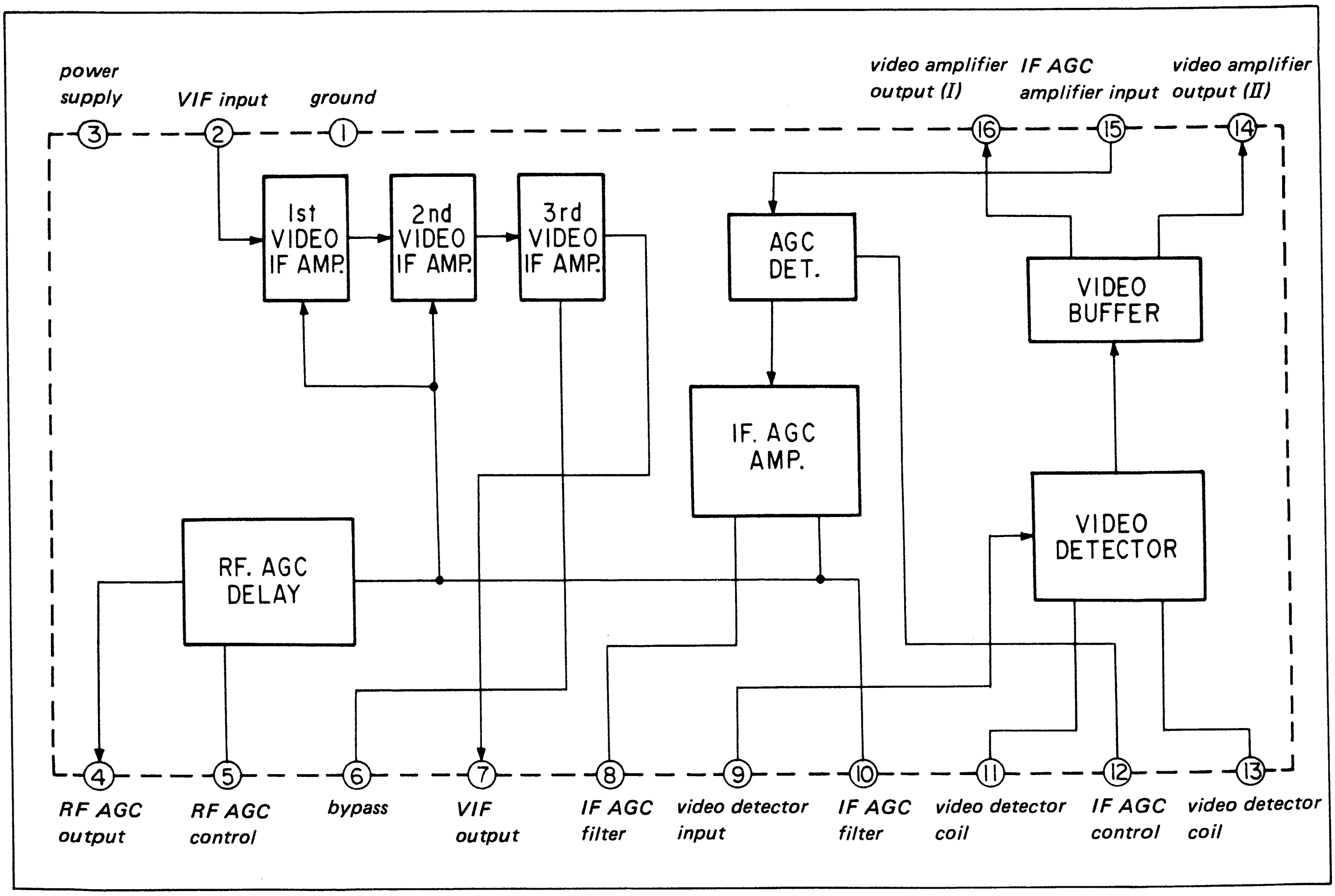

power supply
VIF input
ground
video amplifier output (I)
IF AGC amplifier input
video amplifier output (II)
③
②
①
⑯
⑮
⑭
1st VIDEO IF AMP.
2nd VIDEO IF AMP.
3rd VIDEO IF AMP.
AGC DET.
VIDEO BUFFER
IF. AGC AMP.
RF. AGC DELAY
VIDEO DETECTOR
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
RF AGC output
RF AGC control
bypass
VIF output
IF AGC filter
video detector input
IF AGC filter
video detector coil
IF AGC control
video detector coil

Fig. 2-6. IC201 (M51364L) Block Diagram

2-3. IC251 (M51378L) INTERNAL CIRCUITRY

The internal circuit structure consists of a 3-stage limiter amp and differential peak detector. The limiter amp is a 3-stage differential amp. There is a secondary active LPF between the limiter amp and the FM detector.
The pin ⑤ chemical capacitor is for improvement of buzz resulting form power supply ripple. It should be as large as possible. Fig. 3-1 is the block diagram of IC251.

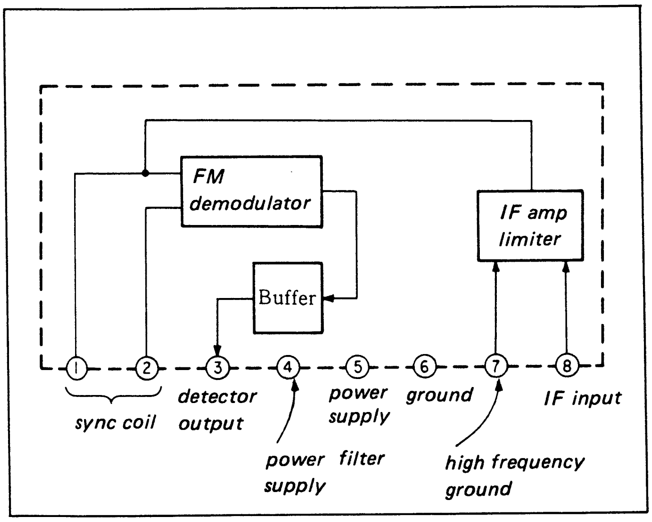

FM demodulator
Buffer
IF amp limiter
①
②
③
④
⑤
⑥
⑦
⑧
sync coil
detector output
power filter supply
power supply
ground
high frequency ground
IF input

Fig. 2-7. Block Diagram

2-4. DEFLECTION CORRECTION CIRCUITS

FD-210BE's flat-type CRT, by virtue of its very nature, has large deflection distortion.

2-4-1. Distortion Relative to Horizontal Axis (Curve Distortion)

As shown in Fig. 4-1, the horizontal axis is part of the curve, therefore the name curve distortion. Fig. 4-2 shows the waveform necessary for curve correction.

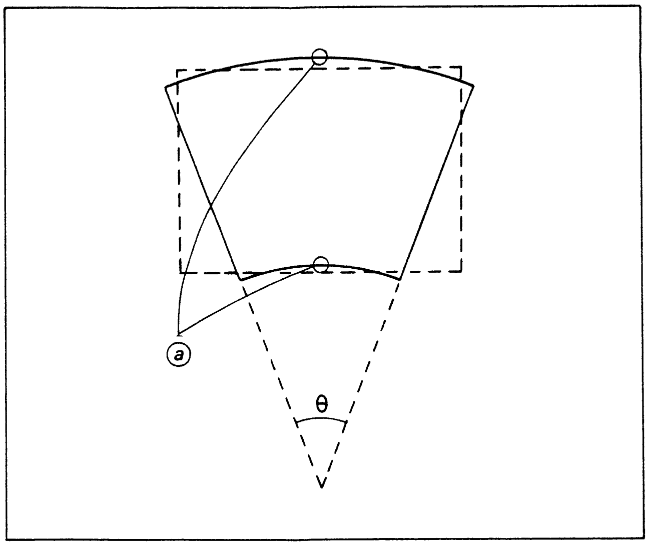


Fig. 2-8. Curve Distortion

In order to lower the part labeled ⓐ in Fig. 4-1, a voltage waveform as shown in Fig. 4-2(b) should be superimposed on vertical deflection voltage.

[Vertical Deflection Waveform and Output Circuit]

This waveform includes the following meaning.
The H parabola waveform is for curve distortion correction. The change at the beginning and end of V is because the curve distortion amount changes. The overall downward bulge is for coupling capacitor correction and linearity correction.

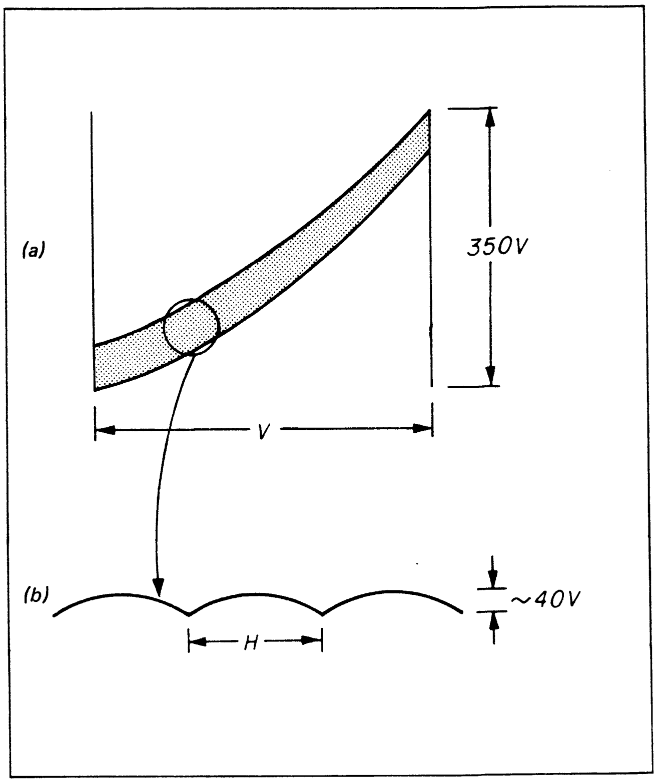


Fig. 2-9. Vertical Deflection Waveform

An approximately 360x (50 dB) linear amp is employed for CRT drive, and is applied to the deflection plate via the coupling capacitor. NFB is applied by R831, R835 and R874, and amp gain is 50 dB.
R701, R705 and R831, R835 are the same size and suppress power supply fluctuation resulting from amplitude.

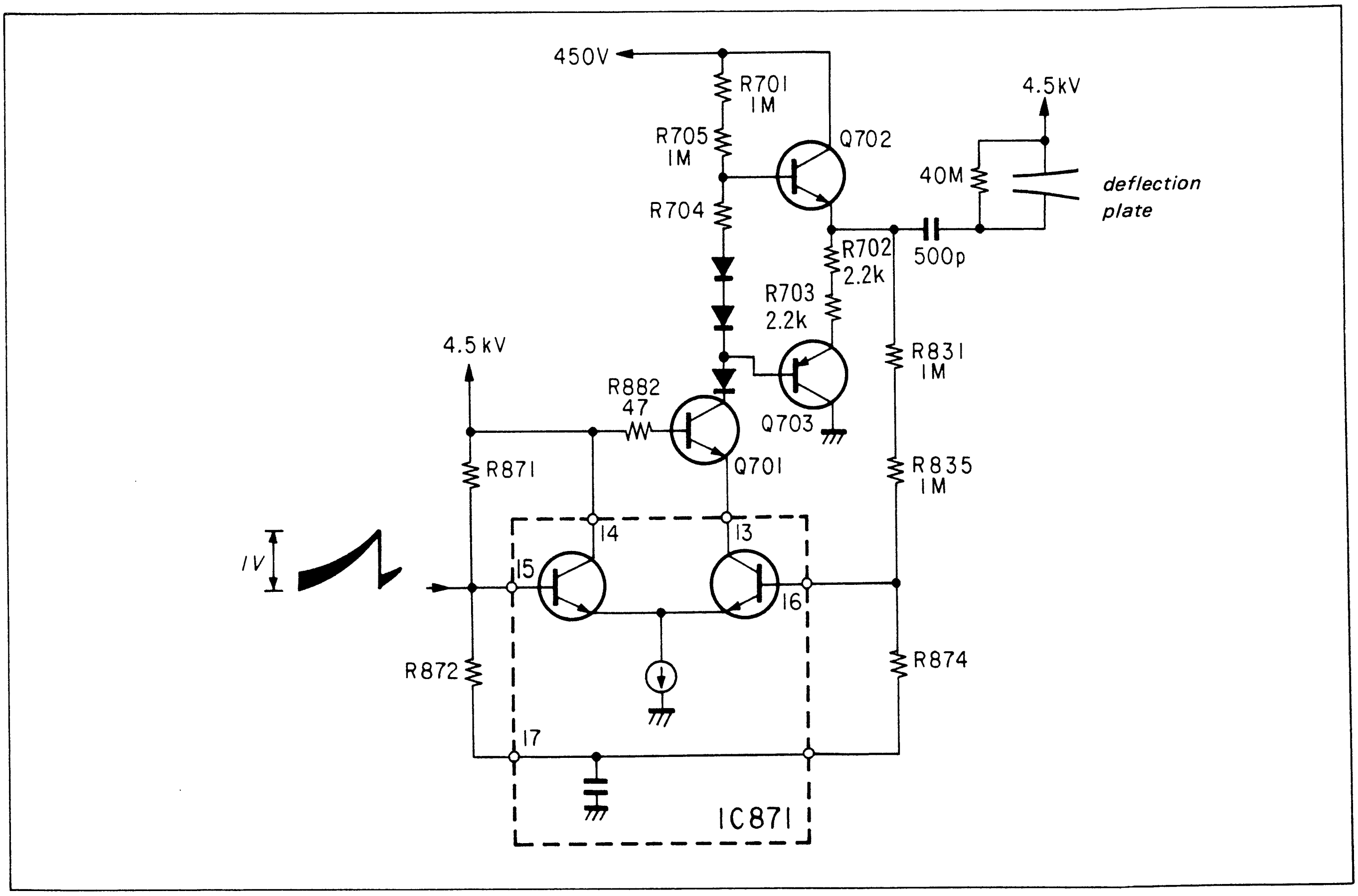

450V
R701
1M
R705
1M
Q702
4.5kV
40M
deflection plate
R704
R702
2.2k
500p
R703
2.2k
4.5kV
R882
47
R831
1M
Q703
Q701
R871
R835
1M
1V
14
13
15
16
R872
R874
17
IC871

Fig. 2-10. Vertical Deflection Output Circuit

2-4-2. Incidental Distortion
[Fly-back Interval and Blanking Interval]

For this correction, a horizontal cycle parabola is applied to the vertical deflection waveform, but when the beginning and end levels of the raster do not match, as in Fig. 4-4(b), the horizontal axis slants.

Therefore, it is necessary to delay the horizontal axis parabola circuit start several μsec. See Fig. 4-4(b), the horizontal axis slants.

Therefore, it is necessary to delay the horizontal axis parabola circuit start several μsec. See Fig. 4-4(c).

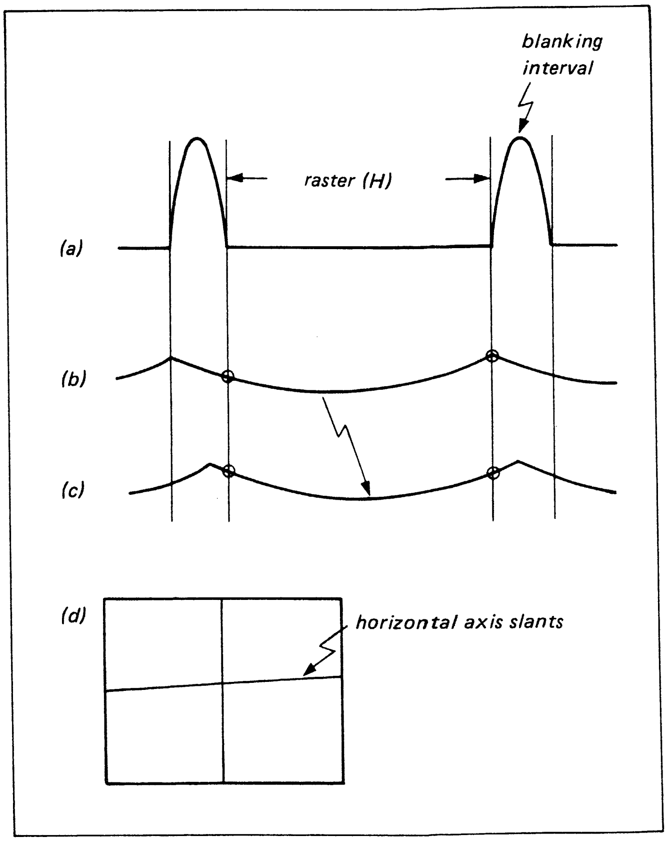

blanking interval
raster (H)
(a)
(b)
(c)
(d)
horizontal axis slants

Fig. 2-11.

2-4-3. Distortion Relative to Vertical Axis (Keystone Distortion)

On a flat-type CRT, the difference in time until landing is different between the beginning and end of the vertical deflection, so, as shown in Fig. 4-5, the upper part spreads out. This shape ressembles the keystone of an arch; hence the name. Fig. 4-6 is the keystone correction waveform.

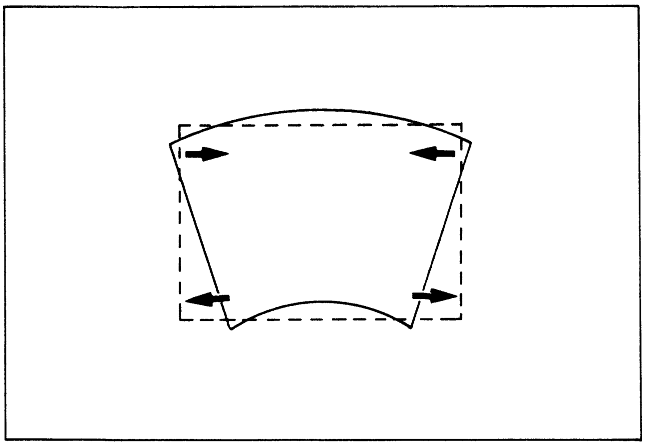


Fig. 2-12. Keystone Distortion

[Horizontal Deflection Waveform and Output Circuit]

Because the horizontal deflection circuit is electromagnetic deflection, it is not very different from a regular CRT. Correction is performed by power supply modulation. The power supply waveform is modulated by the vertical deflection cycle as shown in Fig. 4-6, and a parabola is superimposed.

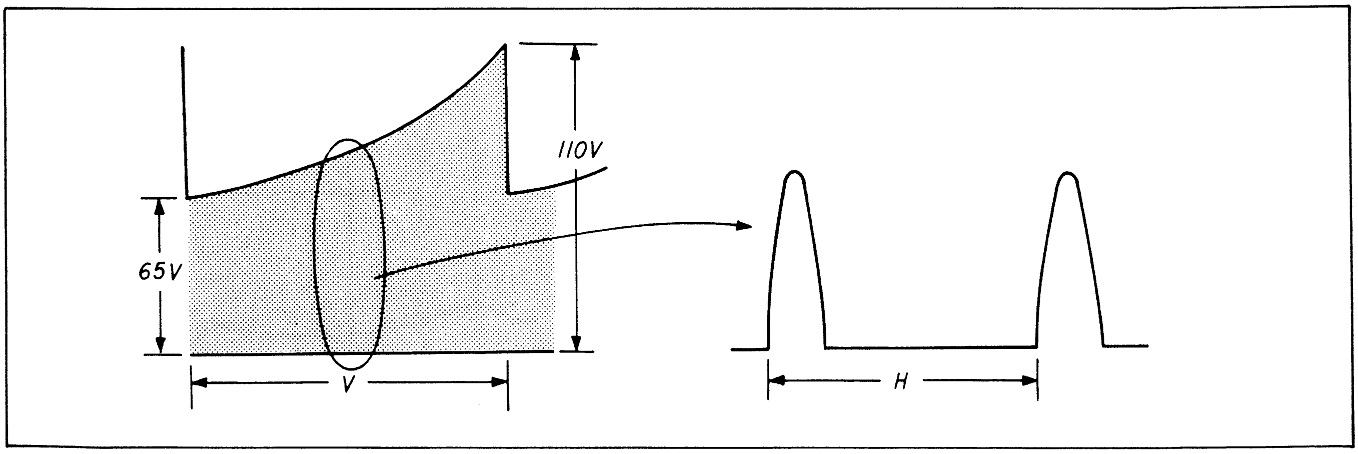


Fig. 2-13.

The modulation factor of this power supply modulation is large and changes sharply at the beginning of V, so ringing is easily generated.

C807 1μF is added to suppress this.

The modulator circuit utilizes part of IC871 CX22010 and structures SEPP output. The gain is about 7 times.

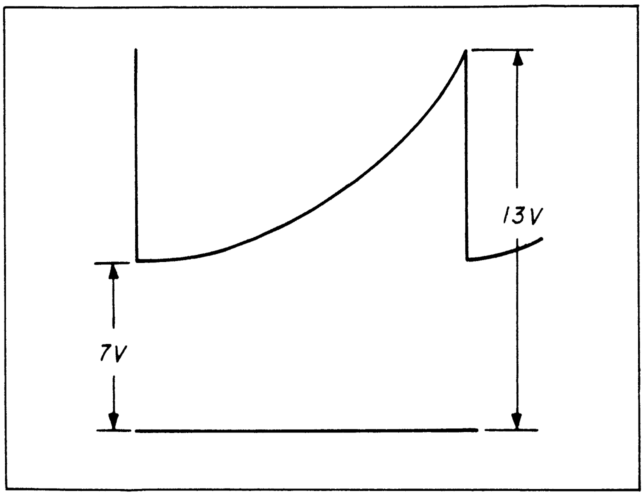


Fig. 2-14. Horizontal Deflection Power Supply Waveform

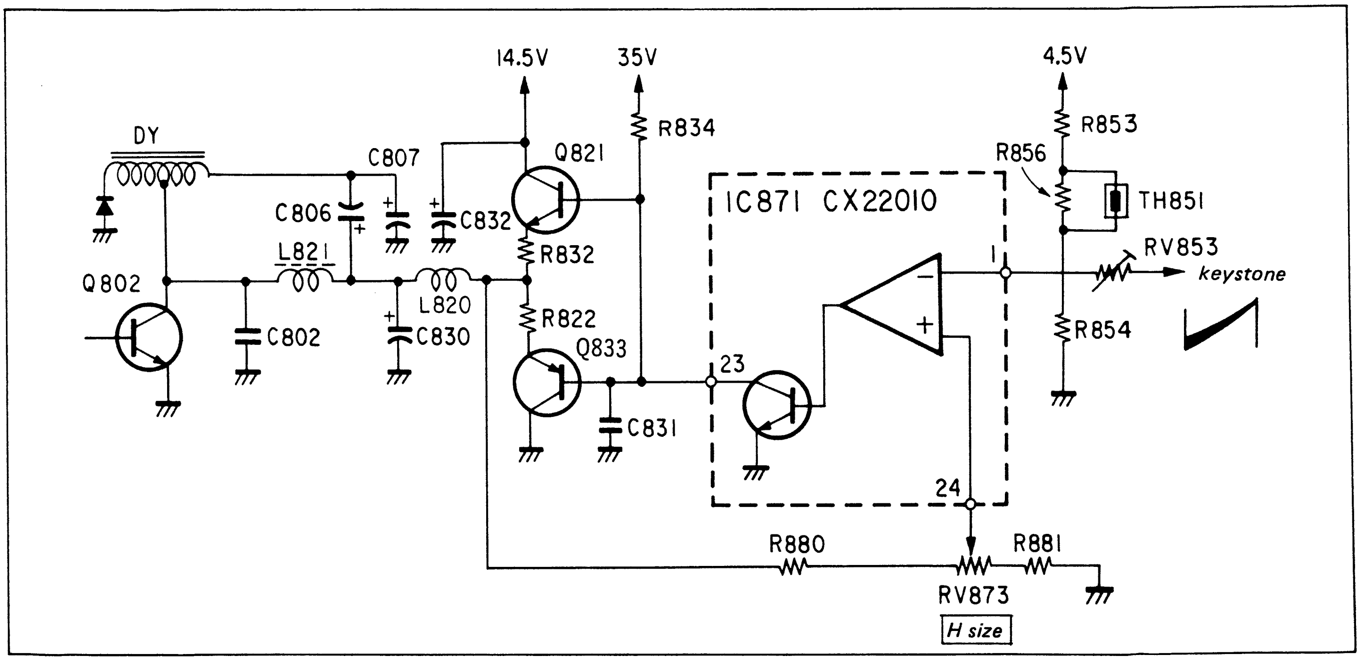

14.5V
35V
4.5V
DY
C807
Q821
R834
R853
R856
TH851
IC871 CX22010
C806
C832
L821
R832
RV853
keystone
Q802
L820
R822
R854
C802
C830
Q833
23
C831
24
1
R880
R881
RV873
H size

Fig. 2-15. Horizontal Deflection Circuit

RV873 changes modulation output circuit gain and adjusts horizontal deflection width and so is called horizontal amplitude.

2-4-4. Horizontal Parabola Circuit

This circuit consists of the H out pulse phase shifter circuit and, synchronized with this, the ramp wave generator section and integrator, and uses part of IC871 CX22010.

[Phase Shifter Circuit]

As shown in Fig. 4-6, the H out pulse is modulated and cannot be made into a trigger signal as is. On FD-210BE, as in Fig. 4-9, the forward direction voltage of 4 diodes is used to clip it, then it is delayed by the RC of RV872 + R877 and C875 + C879. RV872 is for adjustment during this delay time, and the horizontal axis slant can be varied. This adjustment is called horizontal adjustment. The reason for clipping with the diodes is to match up with IC871 CX22010 input sensitivity temperature response. The circuit formed by Q852 and Q851 is the trigger off circuit, which shorts pin ⑩ after one trigger enters and the oscillator inverts, so that a longer trigger does not enter. Without this, horizontal stripes would appear on the picture if the trigger waveform changed.

[Ramp Wave Generator]

This is a ramp wave oscillator with sync pin, and is a differential amp with positive feedback circuit added. The constant current source is built-in to IC871 CX22010, so C873 can be external.

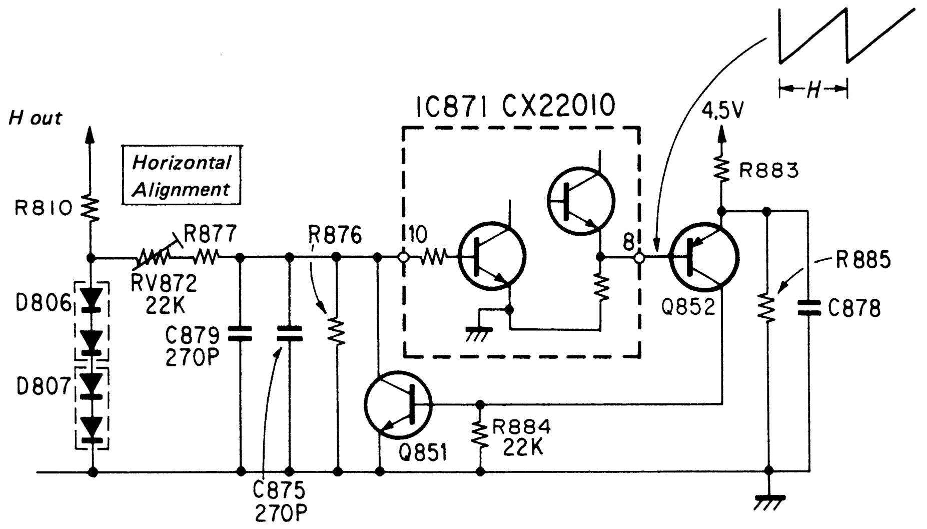

H out
Horizontal Alignment
R810
R877
RV872
22K
R876
D806
D807
C879
270P
C875
270P
IC871 CX22010
10
8
4.5V
H
R883
R885
C878
Q852
Q851
R884
22K

Fig. 2-16. Phase Shifter Circuit

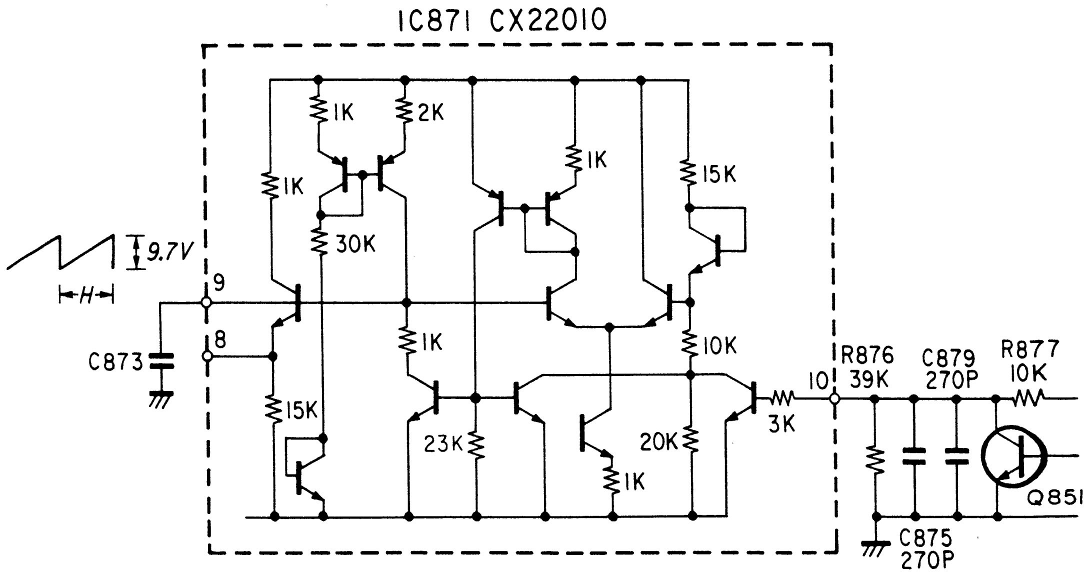
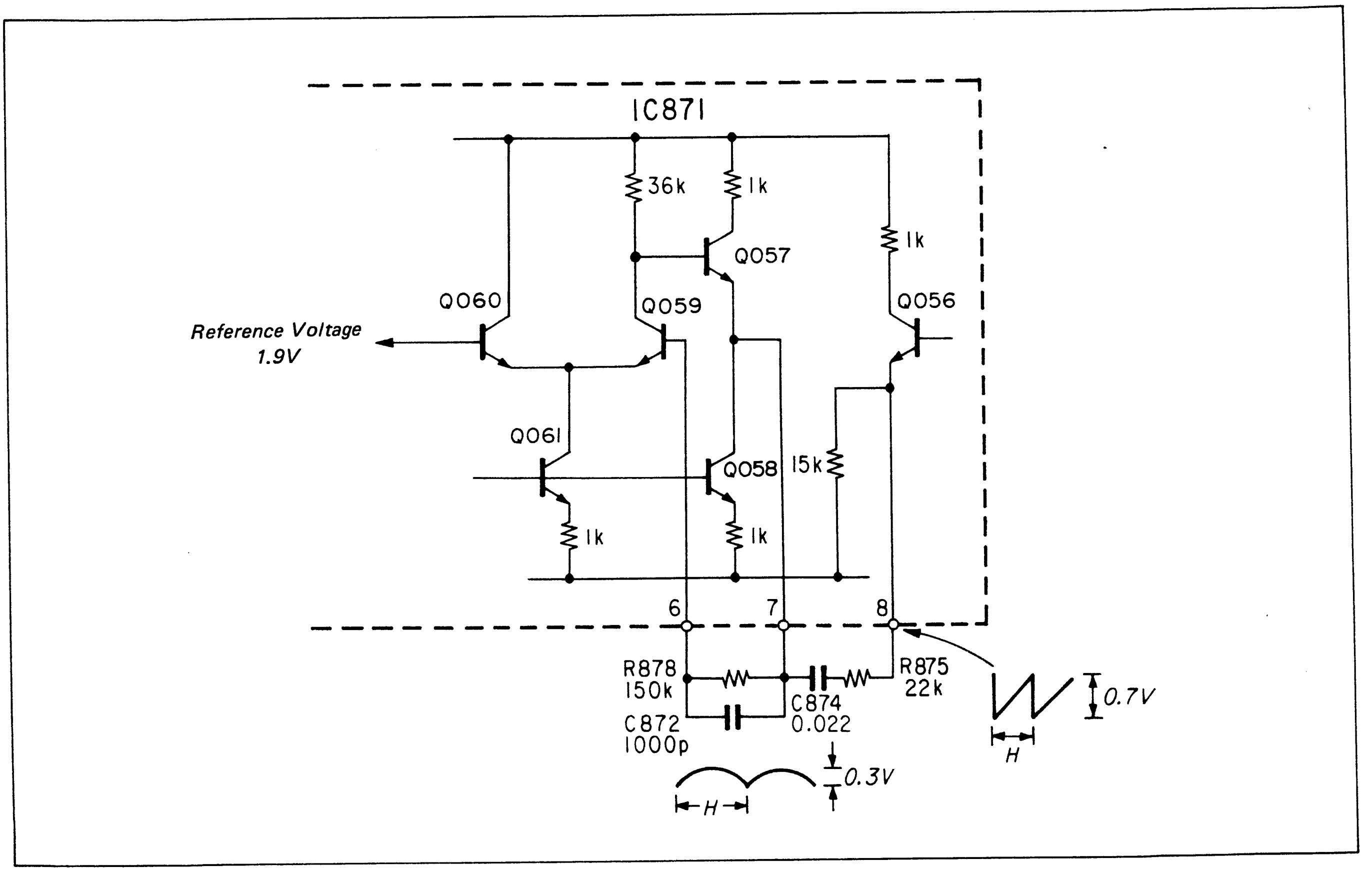

IC871 CX22010
1K
2K
1K
1K
15K
30K
9.7V
H
9
8
C873
1K
10K
15K
23K
1K
20K
3K
10
R876
39K
C879
270P
R877
10K
Q851
C875
270P

Fig. 2-17. H. Ramp Wave Generator Circuit

[Integrator]

In order to make the parabola, the ramp wave is integrated. On IC871 CX22010, an amp with emitter-follower is used for the differential amp, and gain is about 32 dB.

The 0.7 Vp-p ramp wave output from pin ⑧ passes through coupling capacitor C874 and is integrated at R875, C872. R878 is a resistor for DC bias. Qo60 base corresponds to the op amp ⊕ input, Qo59 is ⊖ input and Qo57 emitter corresponds to output.



IC871
36k
1k
Q057
1k
Q060
Q059
Q056
Reference Voltage
1.9V
Q061
Q058
15k
1k
1k
6
7
8
R878
150k
C872
1000p
C874
0.022
R875
22k
0.7V
H
0.3V
H

Fig. 2-18. Integration Circuit

2-4-5. Curve Modulation Circuit

The aim of this circuit is to modulate the H. parabola in the vertical cycle to handle the difference with the vertical axis direction curve amount. This is a relatively simple gain control circuit, but it must be able to obtain the modulation signal slant in positive and negative directions.

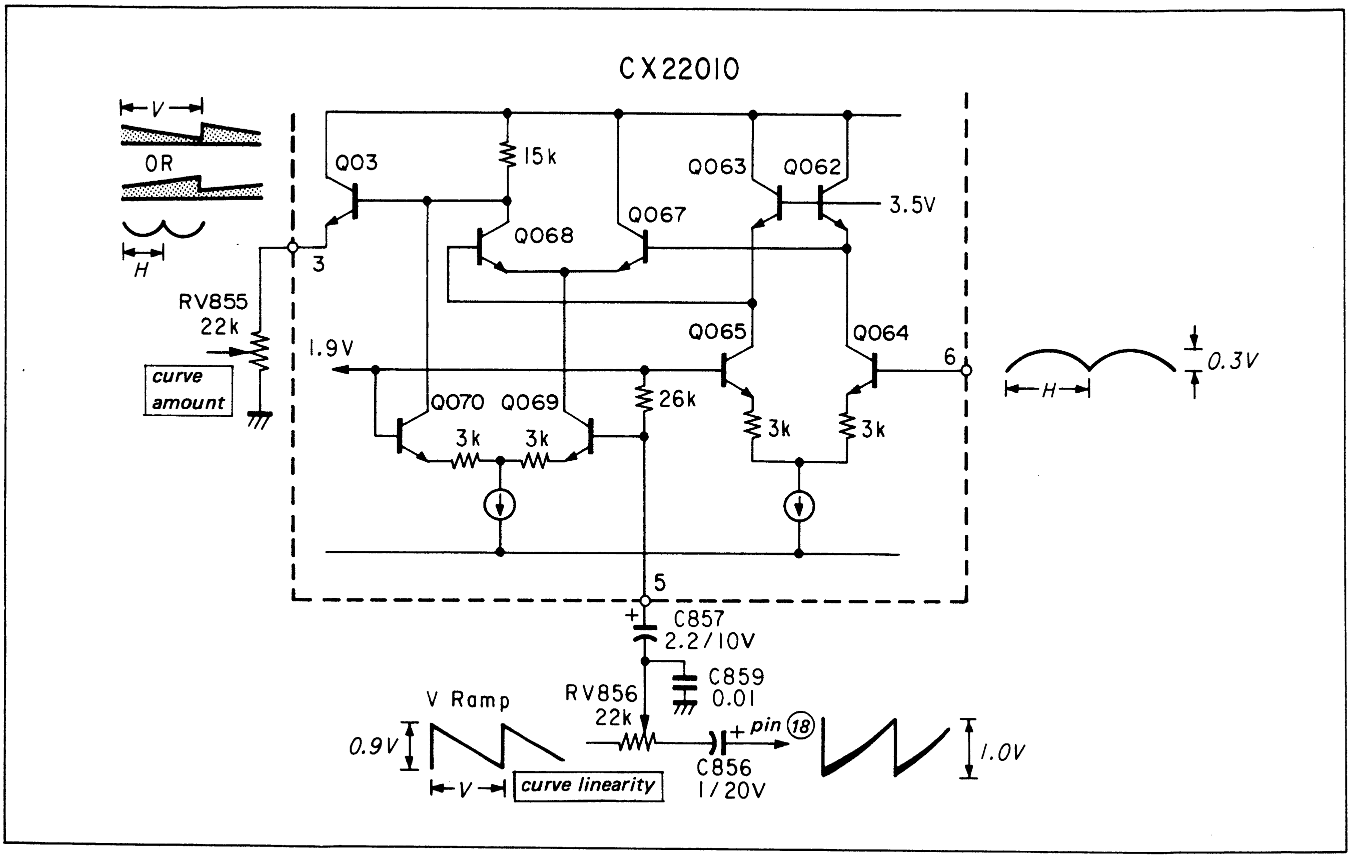
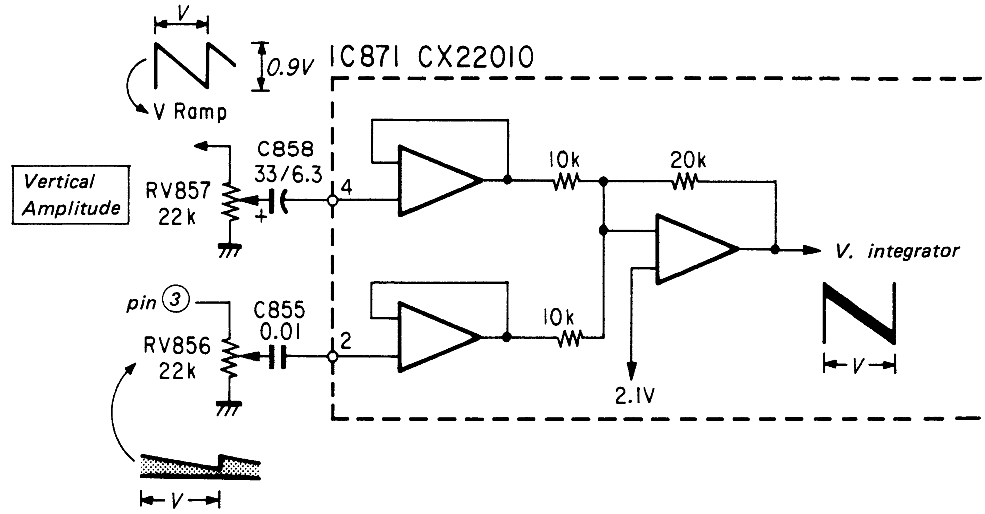

CX22010
V
OR
H
RV855
22k
curve amount
3
Q03
15k
Q068
Q067
Q063
Q062
3.5V
1.9V
Q065
Q064
6
Q070
Q069
3k
3k
26k
3k
3k
5
C857
2.2/10V
C859
0.01
V Ramp
RV856
22k
0.9V
curve linearity
+
pin ⑱
C856
1/20V
1.0V
H
0.3V

Fig. 2-19. Curve Modulation Circuit

Pin ⑥ input is current converted at Qo64, Qo65 differential amp and returned to voltage by Qo68 differential amp load 15kΩ. At this time, if Qo69 current is changed right after changing Qo67, Qo68 differential amp current, the gain can be changed. This property is used to modulate pin ⑥ input with pin ⑤ input. C856, C859 return the waveform from pin ⑧ to a linear waveform. Depending on the position of RV856, the curve correction amount slant can be changed, and the picture curve amount can be made bigger on top or on the bottom. This adjustment is called curve linearity. The waveform modulated in this way appears on pin ③, and total curve amount adjustment can be done by RV855. This is called curve amount.

2-4-6. Mixing Circuit

This circuit is for mixing the vertical deflection vertical ramp wave and curve correction horizontal parabola. RV857 is for V ramp wave adjustment input and is called vertical amplitude.

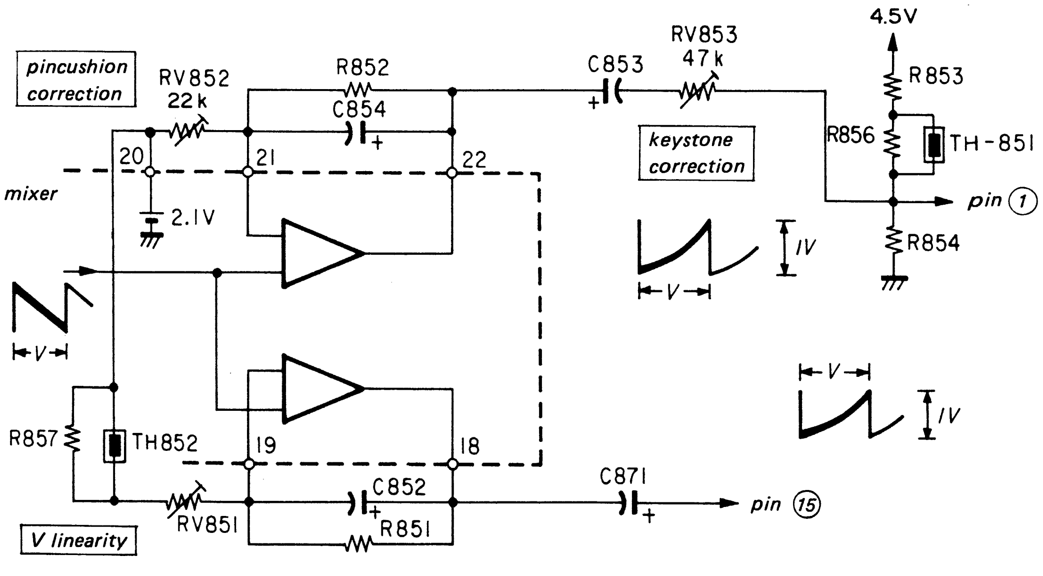


V
0.9V
V Ramp
IC871 CX22010
C858
33/6.3
Vertical Amplitude
RV857
22k
+
4
10k
20k
V. integrator
V
pin ③
C855
0.01
RV856
22k
2
10k
2.1V
V

Fig. 2-20. Mixing Circuit

2-4-7. Integration Circuit

This circuit is to integrate the mixed waveforms for linearity correction and pincushion correction.



pincushion correction
RV852
22k
R852
C854
+
20
21
22
mixer
2.1V
V
C853
+
RV853
47k
keystone correction
4.5V
R853
R856
TH-851
pin ①
R854
1V
V
V
1V
R857
TH852
19
18
RV851
C852
+
R851
C871
+
pin ⑮
V linearity

Fig. 2-21. Integration Circuit

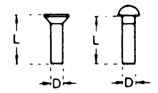
By changing RV852, the integral time constant changes and undulation changes. This adjustment is called pincushion correction. By changing RV851, the time constant changes in the same way, and the coupling capacitor and CRT vertical linearity are corrected. This adjustment is called V linearity.

By changing RV853, the correction voltage applied to pin ① changes, and keystone distortion changes. This adjustment is called keystone correction. The thermistor in series with V linearity VR and the thermistor in pin ① DC bias are for temperature response compensation.

HARDWARE NOMENCLATURE

Screw: – P 3 x 10

L: Length in mm
D: Diameter in mm
Type of head
Indicated slotted-head only.
Unless otherwise indicated, it means
cross-recessed head (Phillips type).

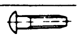
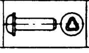
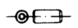
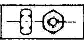


Reference Designation	Shape	Description	Remarks
		SCREWS	
P		pan-head screw	binding-head (B) screw for replacement
PWH		pan-head screw with washer face	binding-head (B) screw and flat washer for replacement
PS PSP		pan-head screw with spring washer	binding-head (B) screw and spring washer for replacement
PSW PSPW		pan-head screw with spring and flat washers	binding-head (B) screw and spring and flat washers for replacement
R		round-head screw	binding-head (B) screw for replacement
K		flat-countersunk-head screw	
RK		oval-countersunk-head screw	
B		binding-head screw	
T		truss-head screw	binding-head (B) screw for replacement
F		flat-fillister-head screw	
RF		fillister-head screw	
BV		brazier-head screw	

Nut, Washer, Retaining ring:

N 3

Diameter of usable screw or shaft
Reference designation

Reference Designation	Shape	Description	Remarks
		SELF-TAPPING SCREWS	
TA		self-tapping screw	ex: TA, P 3 x 10
PTP		pan-head self-tapping screw	binding-head self-tapping (TA, B) screw for replacement
PTPWH		pan-head self-tapping screw with washer face	binding-head self tapping (TA, B) screw and flat washer for replacement
PTTWH		pan-head thread-rolling screw with washer face	binding-head (B) screw and flat washer for replacement
		SET SCREWS	
SC		set screw	
SC		hexagon-socket set screw	ex: SC 2.6 x 4, hexagon socket
		NUT	
N		nut	
		WASHERS	
W		flat washer	
SW		spring washer	
LW		internal-tooth lock washer	ex: LW3, internal
LW		external-tooth lock washer	ex: LW3, external
		RETAINING RINGS	
E		retaining ring	
G		grip-type retaining ring	

9-963-063-02

Sony Corporation

8310407-1
Printed in Japan

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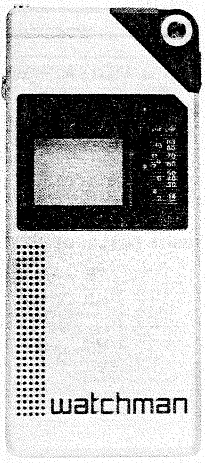
FD-210BE

~~458 28~~

ADJUSTMENT MANUAL

AEP Model
UK Model



watchman

April, 1983

TABLE OF CONTENTS

CIRCUIT ADJUSTMENT

1. NOTE 2
2. C BOARD ADJUSTMENT 2
3. A BOARD ADJUSTMENT 3
4. D2 BOARD ADJUSTMENT 7

MICROFILM

FLAT BLACK AND WHITE TV

SONY®

~~458 287~~

B&W

CIRCUIT ADJUSTMENT

1. NOTE

(1) TEST EQUIPMENT REQUIRED

1. Oscilloscope
2. Digital voltmeter
3. Color bar/pattern generator
4. Frequency counter
5. Regulated dc power supply

(2) INPUT SIGNAL

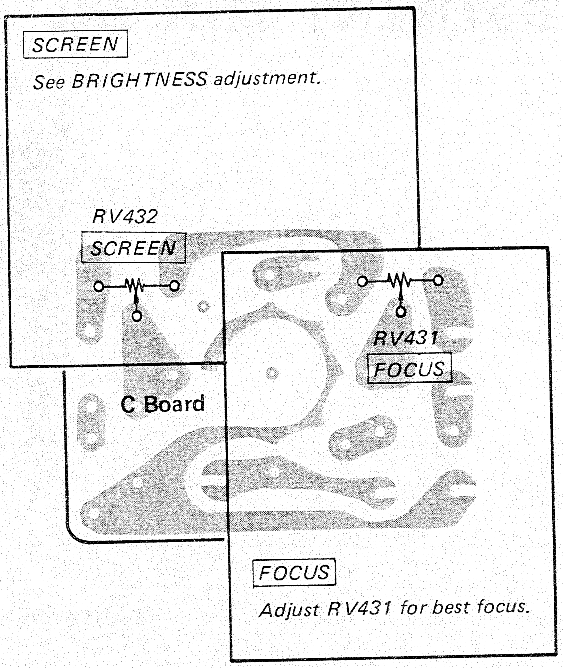
a cross-hatch, a color-bar or an off-air signal

(3) These adjustment should be performed with 6 V dc unless otherwise noted.

(4) ADJUSTMENT

Adjustment	Circuit Board
SCREEN FOCUS	C Board
Channel Indication Circuit RF AGC IF AGC H. Frequency V. Hold Cut Off Duty MAX 4.5 V Adj 14.5 V Adj Brightness Contrast	A Board
H. Alignment Barrel Correction V. Linearity H. Size V. Size Curve Mag Adjustment Curve Distortion Key Stone Correction	D2 Board

2. C BOARD ADJUSTMENT



SCREEN

See BRIGHTNESS adjustment.

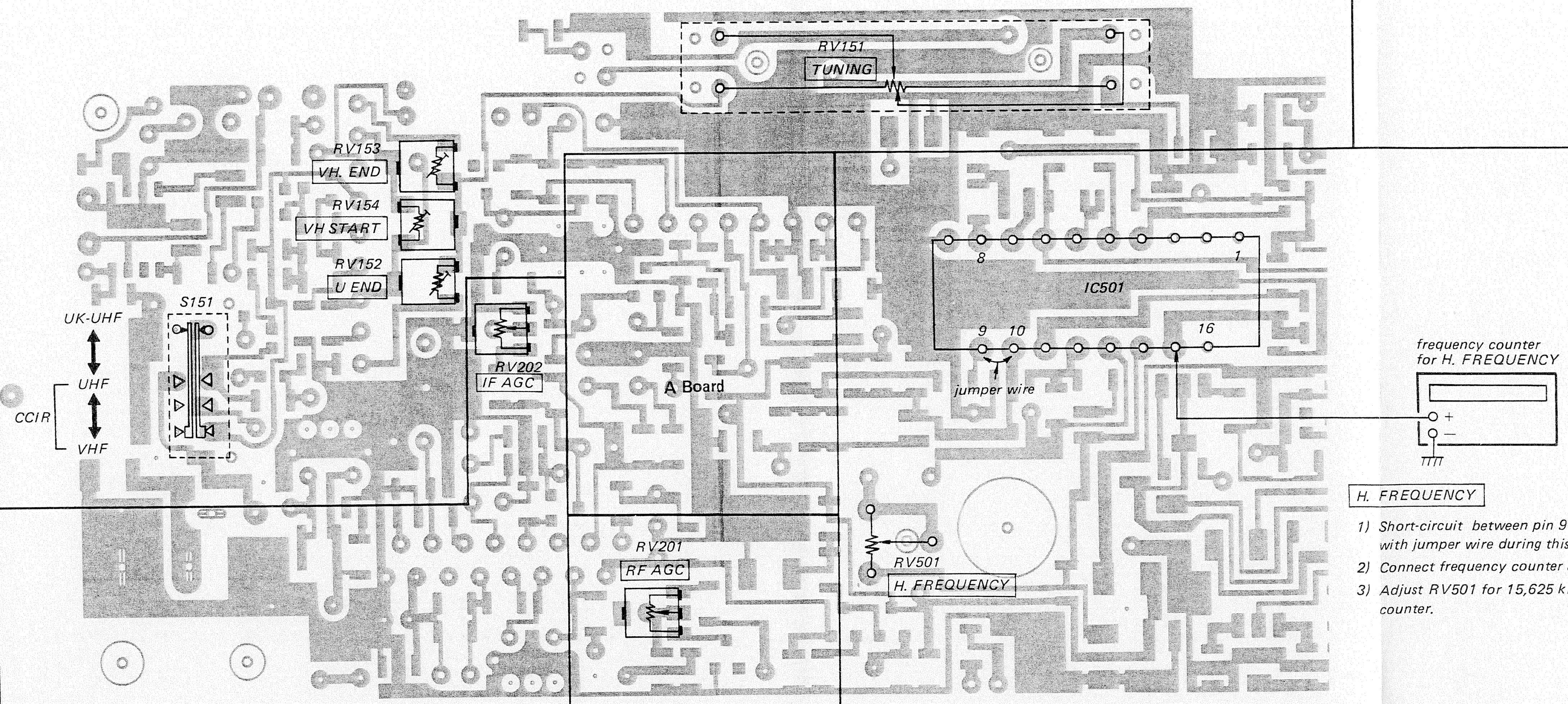
FOCUS

Adjust RV431 for best focus.

3. A BOARD ADJUSTMENT

CHANNEL INDICATION CIRCUIT

1) Set Band Select Switch to UHF (UK).
2) Set pointer at channel 68.
3) Adjust RV152 to receive channel 68.
4) Set pointer at channel 21.
5) Adjust RV152 to receive channel 21.
6) Repeat steps 1) – 5).
7) Set Band Select Switch to VHF.
8) Set pointer at channel 12.
9) Adjust RV153 to receive channel 12.
10) Set pointer at channel 5.
11) Adjust RV154 to receive channel 5.
12) Repeat steps 8) – 11).


RV151
TUNING
RV153
VH. END
RV154
VH START
RV152
U END
S151
UK-UHF
UHF
CCIR
VHF
RV202
IF AGC
A Board
8
1
IC501
9
10
16
jumper wire
frequency counter for H. FREQUENCY
+
−
RV201
RF AGC
RV501
H. FREQUENCY

IF AGC

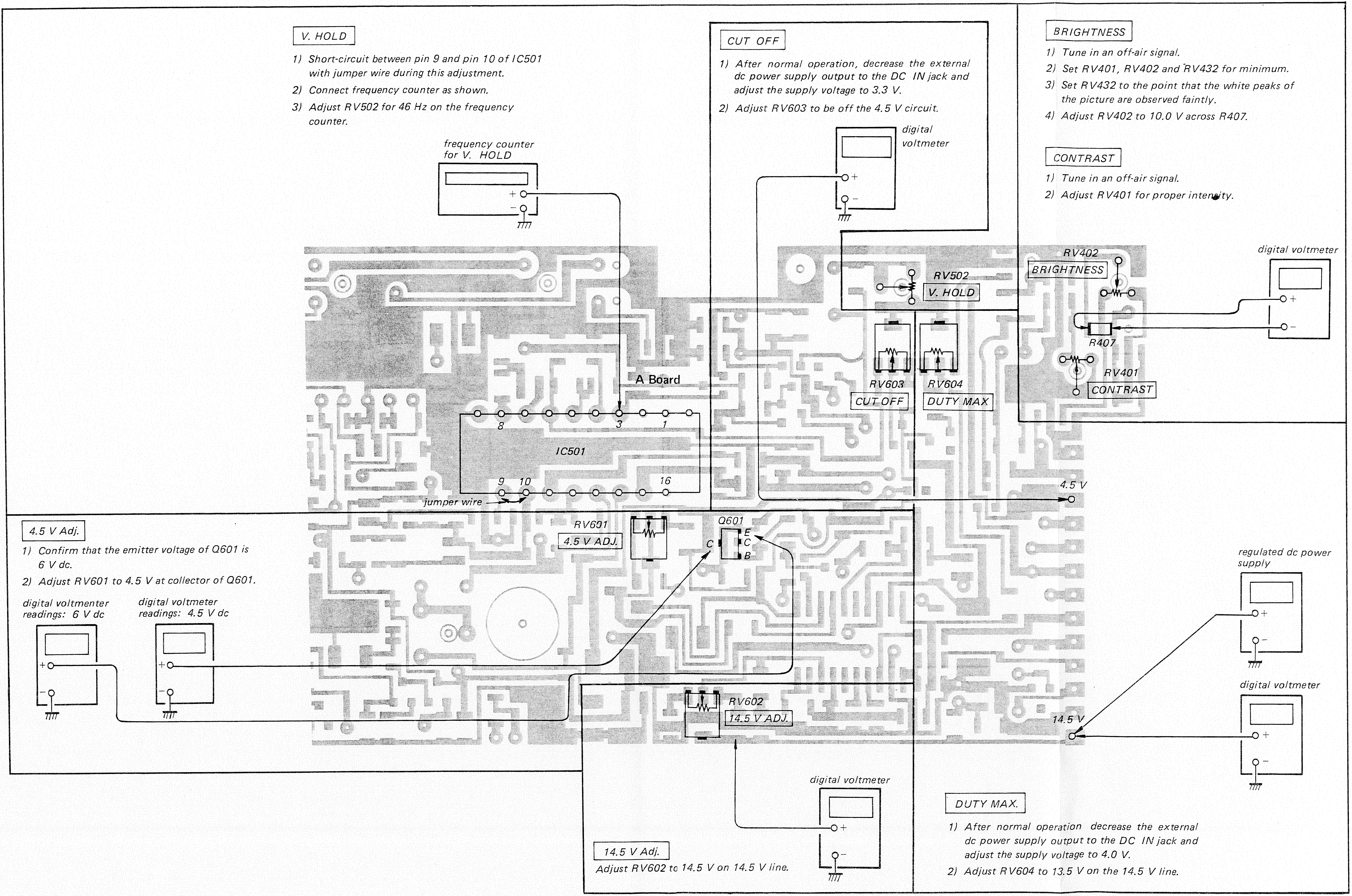
1) Tune in an off-air signal.
2) Adjust RV202 for stable and proper intensity picture.

RF AGC

1) Tune in an off-air signal.
2) Adjust RV201 so that snow noise disappear from the picture.

H. FREQUENCY

1) Short-circuit between pin 9 and pin 10 of IC501 with jumper wire during this adjustment.
2) Connect frequency counter as shown.
3) Adjust RV501 for 15,625 kHz on the frequency counter.


frequency counter for V. HOLD
+
−
A Board
IC501
8
3
1
9
10
16
jumper wire
digital voltmeter
+
−
RV502
V. HOLD
RV603
CUT OFF
RV604
DUTY MAX
RV402
BRIGHTNESS
R407
RV401
CONTRAST
digital voltmeter
4.5 V
RV601
4.5 V ADJ.
Q601
E
C
B
C
digital voltmenter readings: 6 V dc
digital voltmeter readings: 4.5 V dc
RV602
14.5 V ADJ.
regulated dc power supply
digital voltmeter
14.5 V
digital voltmeter

V. HOLD

1) Short-circuit between pin 9 and pin 10 of IC501 with jumper wire during this adjustment.
2) Connect frequency counter as shown.
3) Adjust RV502 for 46 Hz on the frequency counter.

CUT OFF

1) After normal operation, decrease the external dc power supply output to the DC IN jack and adjust the supply voltage to 3.3 V.
2) Adjust RV603 to be off the 4.5 V circuit.

BRIGHTNESS

1) Tune in an off-air signal.
2) Set RV401, RV402 and RV432 for minimum.
3) Set RV432 to the point that the white peaks of the picture are observed faintly.
4) Adjust RV402 to 10.0 V across R407.

CONTRAST

1) Tune in an off-air signal.
2) Adjust RV401 for proper intensity.

4.5 V Adj.

1) Confirm that the emitter voltage of Q601 is 6 V dc.
2) Adjust RV601 to 4.5 V at collector of Q601.

14.5 V Adj.

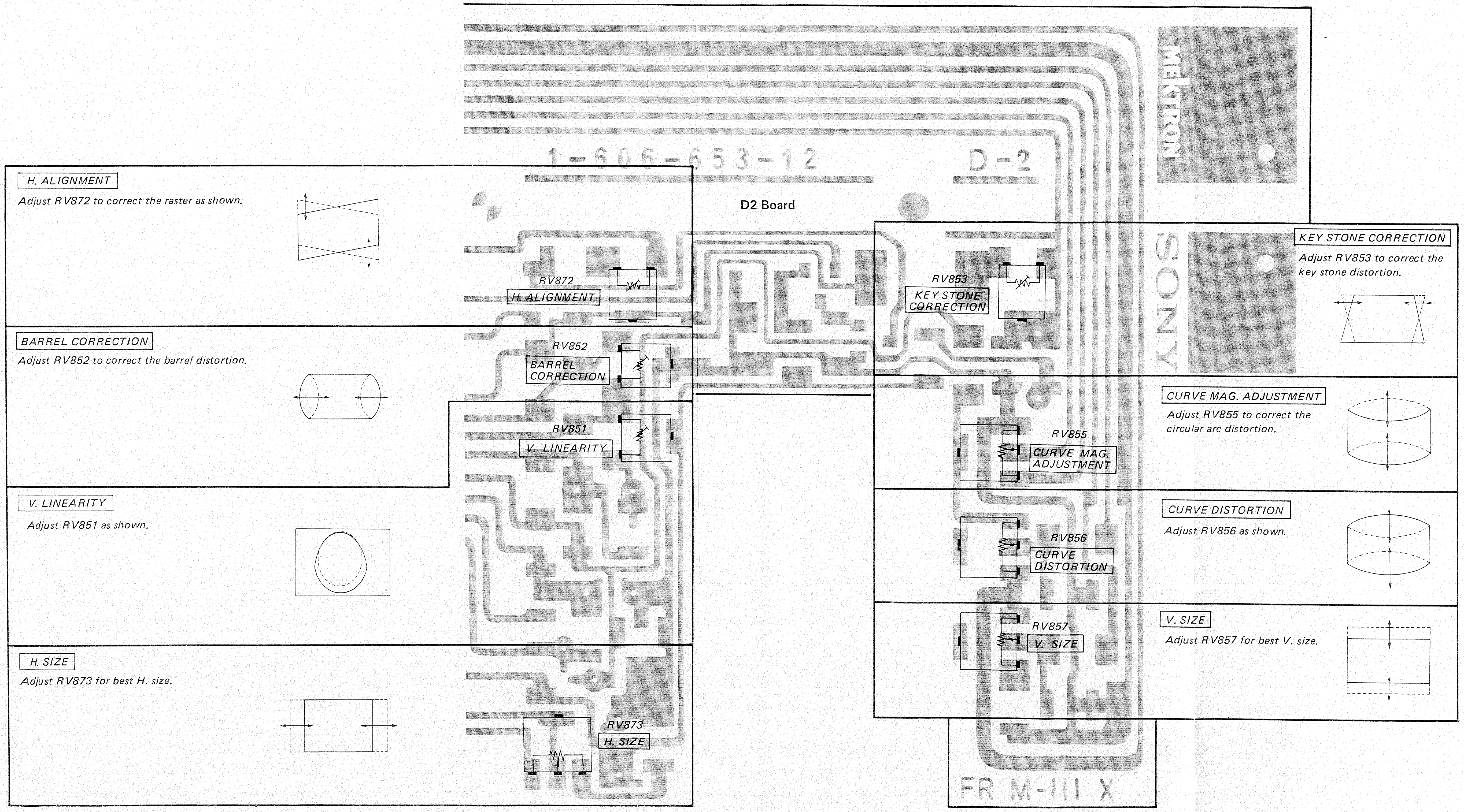
Adjust RV602 to 14.5 V on 14.5 V line.

DUTY MAX.

1) After normal operation decrease the external dc power supply output to the DC IN jack and adjust the supply voltage to 4.0 V.
2) Adjust RV604 to 13.5 V on the 14.5 V line.

4. D2 BOARD ADJUSTMENT

– For Picture Correction –


1-606-653-12
D-2
MEKTRON
SONY
D2 Board
RV872
H. ALIGNMENT
RV852
BARREL CORRECTION
RV851
V. LINEARITY
RV873
H. SIZE
RV853
KEY STONE CORRECTION
RV855
CURVE MAG. ADJUSTMENT
RV856
CURVE DISTORTION
RV857
V. SIZE
FR M-III X

H. ALIGNMENT

Adjust RV872 to correct the raster as shown.

BARREL CORRECTION

Adjust RV852 to correct the barrel distortion.

V. LINEARITY

Adjust RV851 as shown.

H. SIZE

Adjust RV873 for best H. size.

KEY STONE CORRECTION

Adjust RV853 to correct the key stone distortion.

CURVE MAG. ADJUSTMENT

Adjust RV855 to correct the circular arc distortion.

CURVE DISTORTION

Adjust RV856 as shown.

V. SIZE

Adjust RV857 for best V. size.

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